News of the Industry Begins Page 27

AUTOMOTIVE INDUSTRIES

LAND AIR WATER

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Volume 68 Number 1

PUBLISHED WEEKLY AT CHESTNUT AND 56TH STREETS
PHILADELPHIA, JANUARY 7, 1933

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STEWART WARNER AUTOMATIC "Full Power" POWER BRAKES

will do more to boost car sales this year than any other feature!

SEE PAGES 42 & 43

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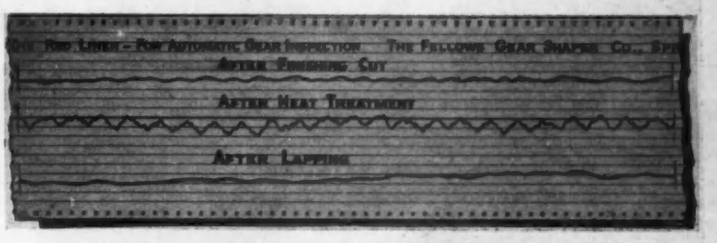
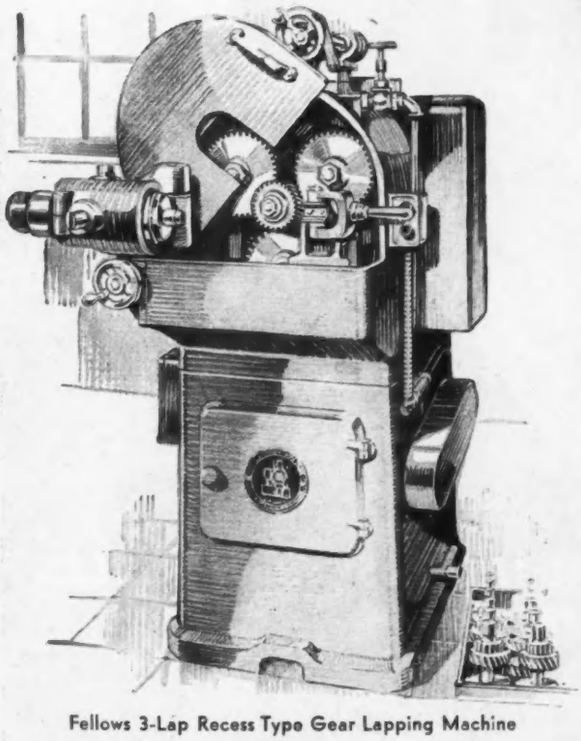
Yes ...and the demand for QUIET gears makes a lap-finishing operation after hardening... *Inevitable*



The improved tooth surface, as indicated on this RED LINER chart, is reflected in smoother and quieter gear action.



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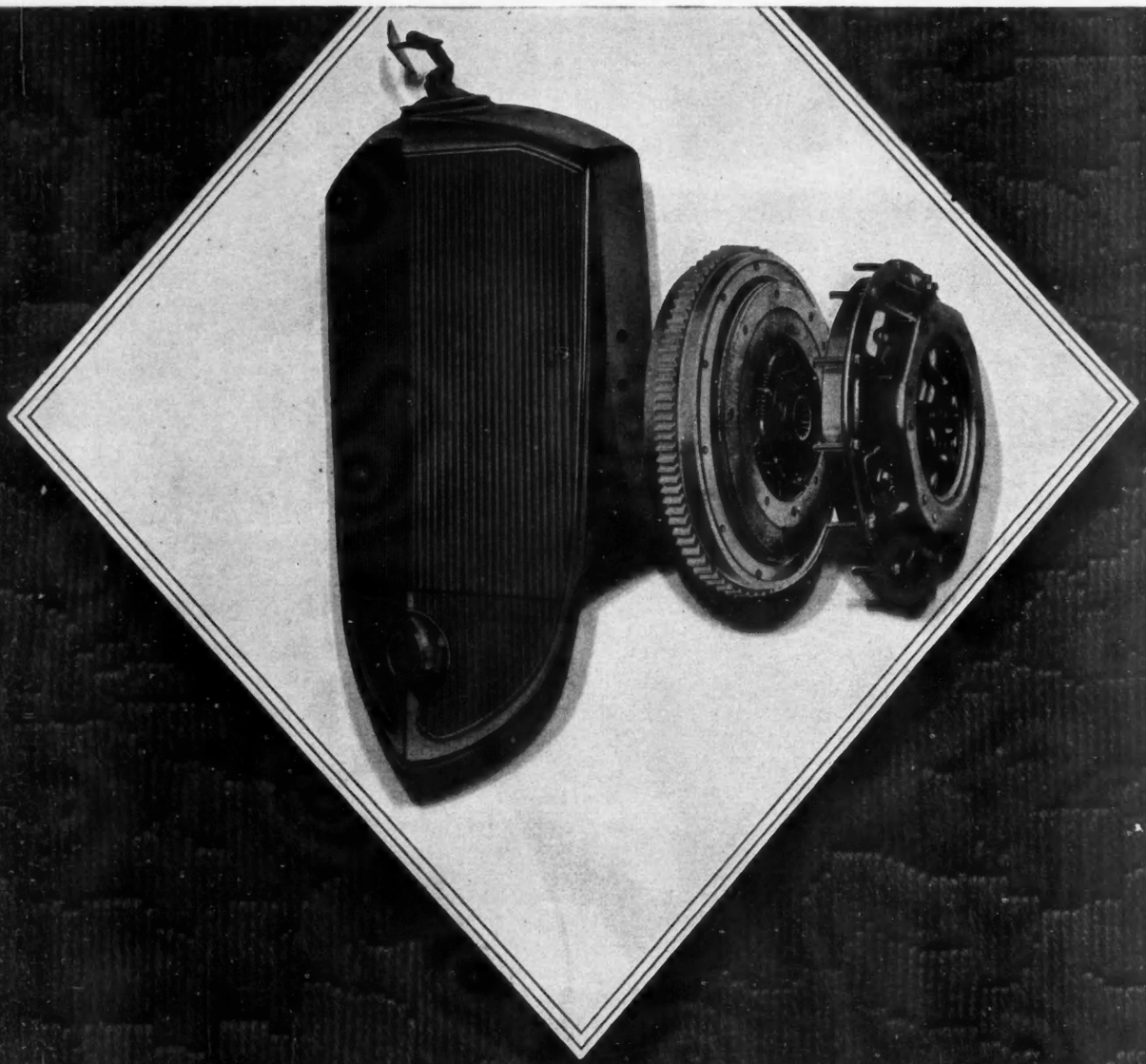

AUTOMOTIVE CLUTCHES, RADIATORS AND GRILLES

LONG

DIV. OF BORG-WARNER CORP.

LONG MANUFACTURING COMPANY - DETROIT, MICHIGAN

AUTOMOTIVE INDUSTRIES
The AUTOMOBILE

Volume 68 Number 1

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Automotive Industries is published every Saturday by

CHILTON COMPANY

Chestnut and 56th Streets, Philadelphia, Pa.

C. A. MUSSELMAN, President and General Manager
J. S. HILDRETH, Vice-Pres. and Director of Sales
W. I. RALPH, Vice-Pres. G. C. BUZBY, Vice-Pres.
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Telephone ..... Sherwood 1424

OFFICES

New York—U. P. C. Bldg., 239 W. 39th St., Phone Pennsylvania 6-0080
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Controlled by United Business Publishers, Inc., 239 W. 39th St., New York; ANDREW C. PEARSON, Chairman, Board of Directors; FRITZ J. FRANK, President; C. A. MUSSELMAN, Vice-President; F. C. STEVENS, Treasurer.

SUBSCRIPTION RATES: United States, United States Possessions, and all countries in the Postal Union, $1.00 per year; Canada and Foreign, $4.00 per year. Single Copies 25c.

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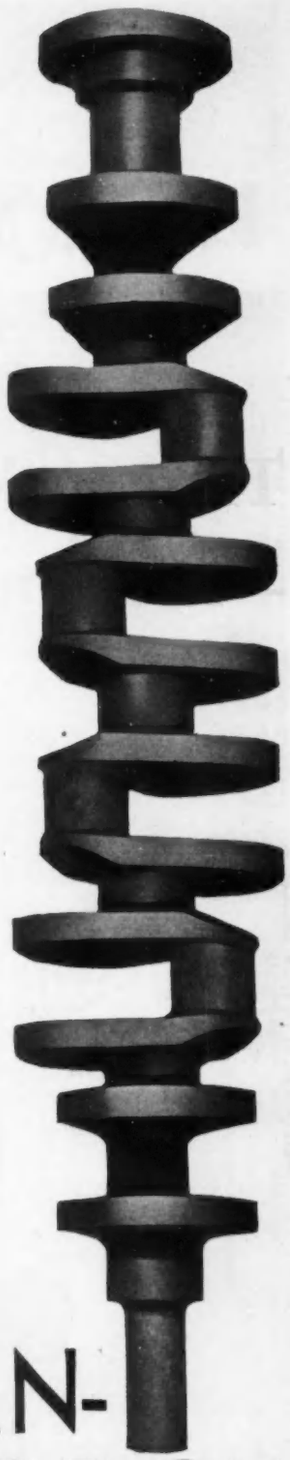
Automotive Industries—The Automobile is a consolidation of the Automobile (monthly) and the Motor Review (weekly), May, 1902; Dealer and Repairman (monthly), October, 1903; the Automobile Magazine (monthly), July, 1907, and the Horseless Age (weekly), founded in 1895, May, 1918.

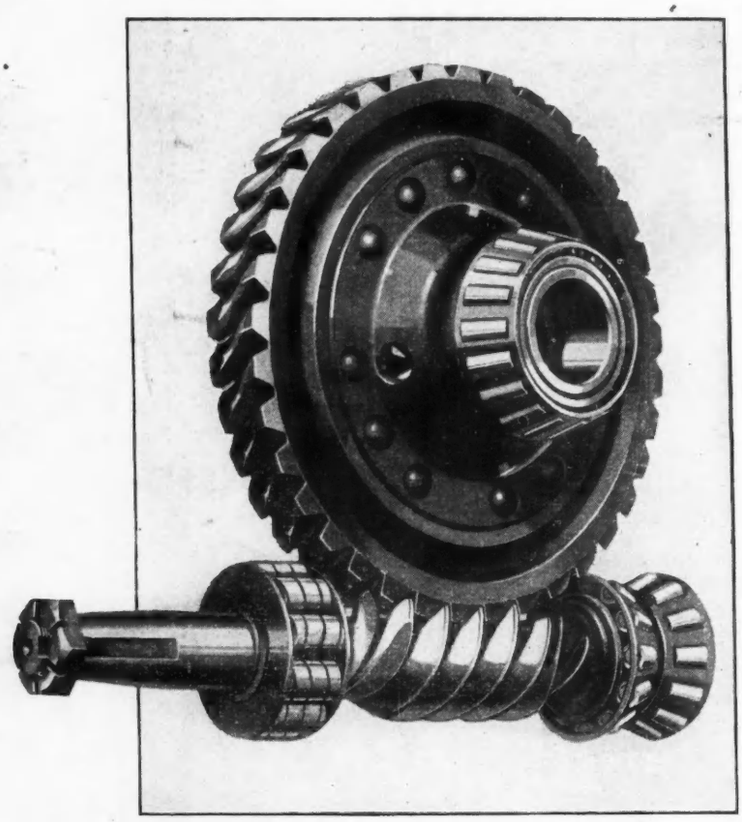


FOREMOST
IN
SCIENTIFIC
DEVELOPMENT

WYMAN-GORDON

AUTOMOTIVE & AVIATION
FORGINGS
WORCESTER, MASS.
HARVEY, ILL.

THIS may be said of Timken Worm Drive under a motor car —it rather spoils you for anything else.



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THE TIMKEN-DETROIT AXLE COMPANY, *Detroit, Michigan*

A memorandum on the

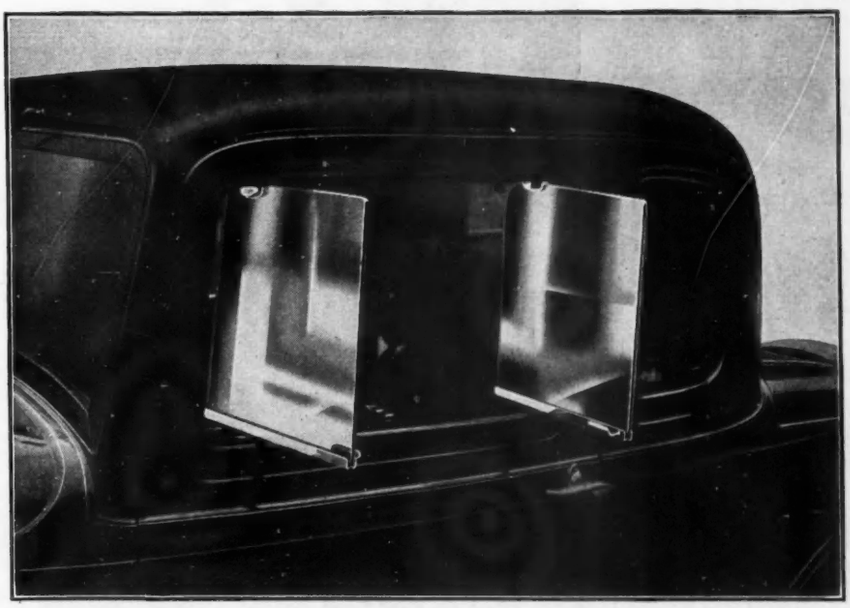
DOLE SYSTEM of VENTILATION

A few unique advantages of the twin windows, Dole System of Ventilation:

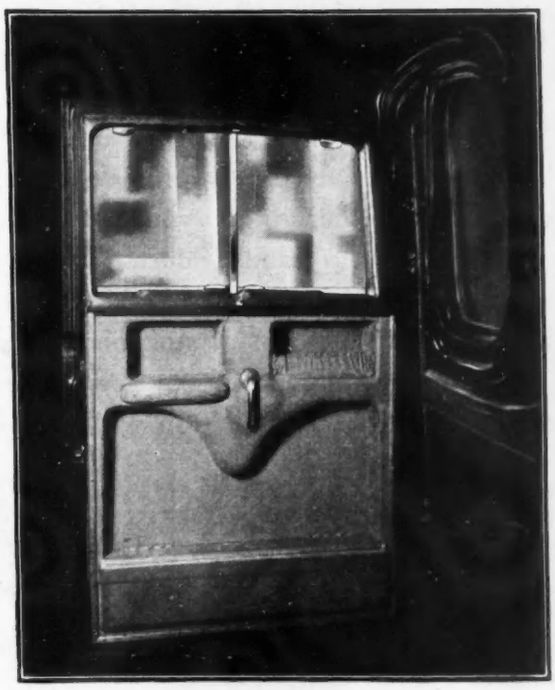
1. Pivots at opposite ends enable the forward window to be used as a deflector, at any angle, in combination with the rear twin window which can be swung outwards to cover, in part, the opening directly behind, thus *avoiding air swirl* around the end of the forward window into the car.
2. The twin windows form an actual venturi for sucking stale air and carbon monoxide from the car interior.
3. Warm air can be drawn through an orifice in the dash which opens into a felt silenced pipe placed to escape fumes and noise. This can be readily adapted to give adequate heating for the whole car.
4. By virtue of this ability to exhaust air, the cowl dash can be readily fitted to supply fresh air into the car in summer.
5. By simple window adjustment no bugs, dust, rain or snow need enter the car while ventilating.
6. Condensation on the inside of car during storms or cold weather is avoided.
7. Instant signalling possible with a swing of the hand—your arm is visible thru the twin windows.
8. The driver can use ears as well as eyes while driving—a distinct safety advantage.
9. A cigar can be easily lighted with a match and the smoke will be quickly drawn out of the nearest window.
10. It is easy to converse with pedestrians by merely swinging open a window instead of opening the door.
11. Additional room for seat width—nearly eight more inches—note the interior treatment—arm rest—tool box, etc., that can be easily arranged.
12. In case of breakage, replacement is inexpensive and rapid—no need to pull the door apart.

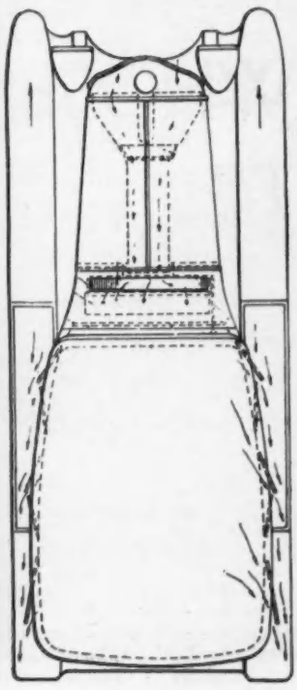
. . . . . and more and more . . . . . .

This is an individual problem. See us or write us today.



PATENTS PENDING ON ALL DEVICES





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THE BILTMORE HOTEL

Detroit Office
3-219 GENERAL MOTORS BUILDING

THE DOLE VALVE COMPANY

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THE DOLE VALVE COMPANY IS THE PIONEER OF CLOSED CAR VENTILATION

SHAKEPROOF

WHOSE PRODUCT WILL HE FAVOR?

THE new year is destined to be a task master. Buyers are going to be more discriminating than ever before. The manufacturer who wants increased sales volume must make certain that his product offers greater value than any competitor's. Meet the demands of 1933 by giving your product the advantages that Shakeproof provides. This powerful locking principle assures you definite improvement in performance—reduces service expense and makes several savings possible on production costs. Get the complete story about Shakeproof at once—write today for our new catalog and price list—the coupon below will bring it to you by return mail.

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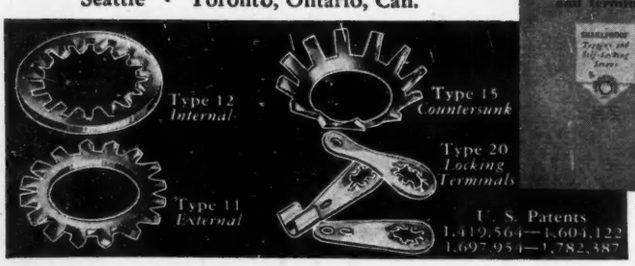

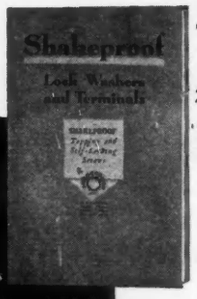

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(Division of Illinois Tool Works)

2505 N. Keeler Avenue Chicago, Illinois

Coupon Gentlemen: Kindly send us your complete catalog and price list. Also, please send us testing samples as indicated.

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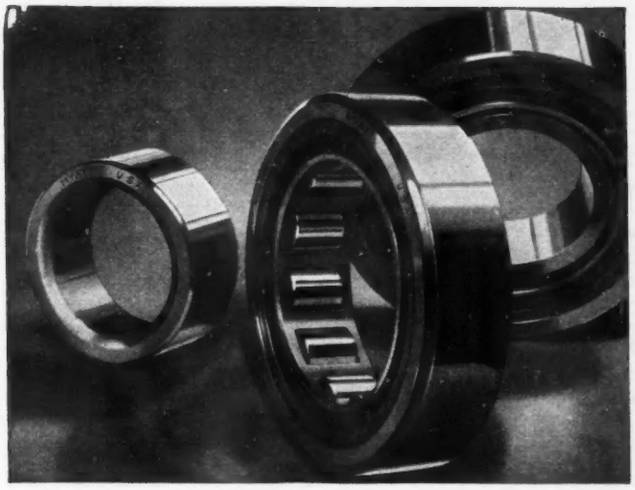
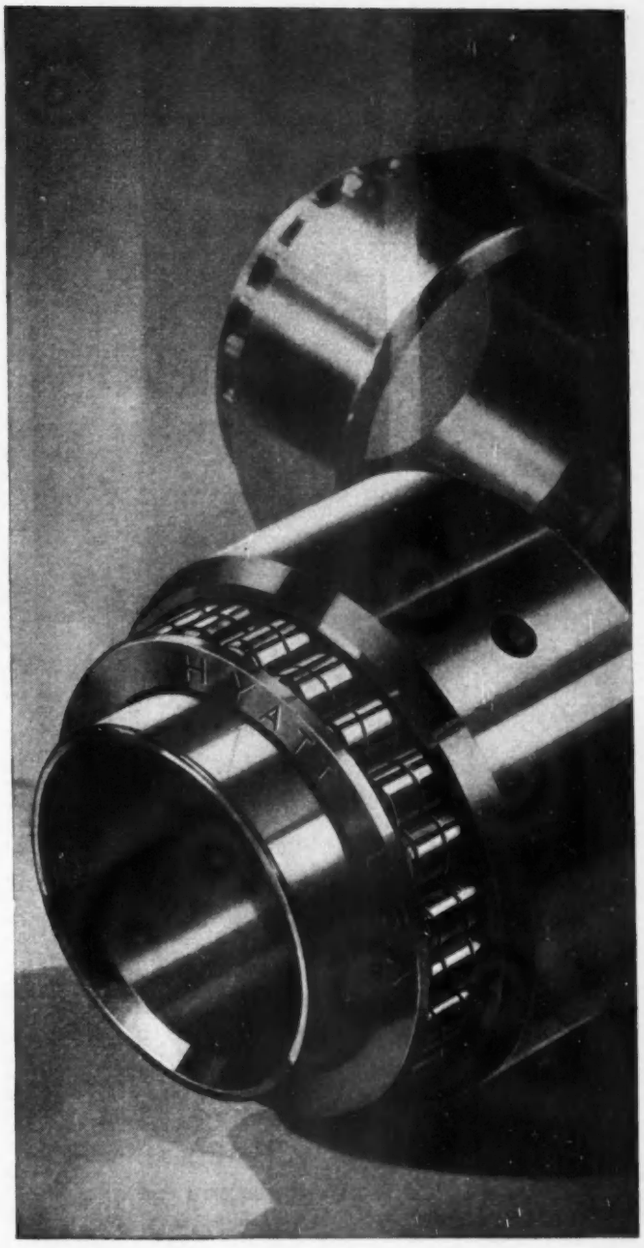


Illustrated at left, Hyatt Single Row Radial Bearing. Below, the Hyatt Standard Series Bearing.



Again and Again

Designs may change, models come and go, but specifications still call for Hyatts.

This preference has prevailed since the beginning of the industry. Many of America's first cars were Hyatt equipped, and Hyatt Quiet Roller Bearings continue to be used increasingly.

In this we take great pride, at the same time realizing the responsibilities involved. For to build bearings in keeping with the high standards of excellence established by the automotive industry is an exacting job.

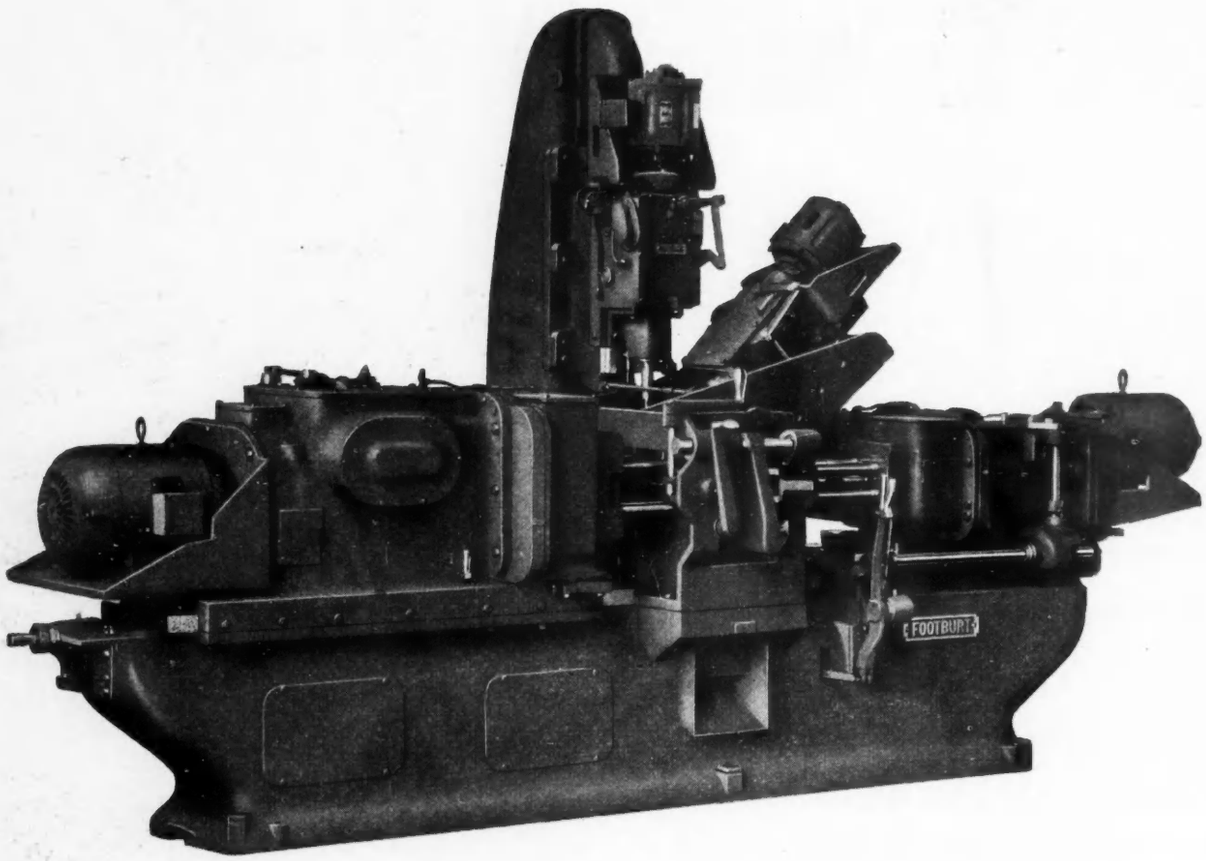
And our way of meeting these demands is through the definite control of quality maintained in every stage of Hyatt design and manufacture. Hyatt Roller Bearing Company, Newark, Detroit, Chicago, Pittsburgh, Oakland.

HYATT

QUIET ROLLER BEARINGS

FOOTBURT

WAY DRILLS



Solving another drilling problem, this Footburt machine illustrates the flexibility possible in making up way drilling equipment.

The units of this machine are placed in the most advantageous position and the size of each unit is in proportion to the travel required and the amount of metal removed. The right hand head has nine spindles and is mounted on a 10" diameter cam unit. The left hand head drills twenty-three holes and is mounted on a 14" diameter cam unit. Both the vertical and angular units have 6" diameter cams. Each carries a single spindle head.

If you have a difficult drilling problem, why not consult Footburt on way drilling equipment? We will be glad to work with you. Just write.

THE FOOTE-BURT COMPANY • CLEVELAND, OHIO

Detroit Office: 4-151 General Motors Building Chicago Office: 565 Washington Boulevard

AUTOMOTIVE INDUSTRIES

Vol. 68, No. 1 • THIRTY-FIFTH YEAR • January 7, 1933

YESTERDAY and TOMORROW

Here is what the automotive industry did in 1932, as revealed by the preliminary facts and figures released today by Alfred Reeves, vice-president and general manager of the National Automobile Chamber of Commerce and additional data compiled by the Chilton statistical department.

	1931	1932*	% Change
REGISTRATIONS—U. S. (Dec. 31)			
Cars	22,555,874	21,177,633	—6.0
Trucks	3,426,515	3,178,908	—7.3
Cars and Trucks	25,982,389	24,356,541	—6.2
PRODUCTION—U. S. and Canada			
Cars	2,038,183	1,198,500	—41.4
Trucks	434,176	237,500	—45.3
Cars and Trucks	2,472,259	1,436,000	—41.9
PRODUCTION OF CARS BY WHOLESALE PRICE CLASSES			
Under $500	1,328,294	781,423	—41.0
$500 to $750	413,929	274,696	—33.8
$750 to $1,000	162,887	83,056	—49.0
$1,000 to $1,500	80,687	38,831	—51.9
$1,500 to $2,000	33,913	8,749	—74.2
$2,000 and over	18,473	11,745	—36.2
WHOLESALE VALUE OF PRODUCTION			
Cars	$1,153,907,947	$646,500,000	—44.0
Trucks	272,748,305	138,000,000	—49.4
Cars and Trucks	1,426,656,252	784,500,000	—45.0

On following pages are descriptions of many of the new cars upon which will be based the industry's drive for real improvement in 1933.

These data and the new product descriptions are of vital interest as we start the New Year.

	1931	1932*	Per Cent Change
Aver. Retail Car Price	$765	$720	— 5.9
Dealer Stocks New Cars, Jan. 1	218,000	163,000	—35.2
Passenger Car Sales	1,908,141	1,096,000	—42.5
Number of Cars Junked	2,477,000	2,474,000	.....
Aver. Age of Vehicles in Use	4.18	4.47	+ 7.0
Number of Junkers in Service	8,400,000	8,500,000	.....
Total Motor User Taxes	$1,025,735,000	$1,085,000,000	+ 6.0
Wholesale Financing	$554,440,655	$327,000,000	—41.0

Retail Financing	1931	1932*	Per Cent Change
Number of New Cars	1,006,875	532,000	—46.8
Total Amount	$558,158,290	$293,000,000	—47.5
Average per New Car	$554	$545	— 1.6
Number of Used Cars	1,370,655	950,000	—30.8
Total Amount	$366,774,095	$229,000,000	—37.5
Average per Used Car	$268	$243	— 9.2
Number of Unclassified Cars	70,715	45,200	—36.1
Total Amount	$25,369,573	$15,100,000	—40.3
Average per Car	$359	$334	— 6.9

* Partly Estimated

Willys-Overland Aims at Year's

by Athel F. Denham

Low overall height, curved down hoods, wheels nearly cowled by skirted fenders contribute to the striking streamlines of the new four and six-cylinder lines

STREAMLINING of bodies reaches new levels in the two lines of cars offered by Willys-Overland, Inc., for 1933, a "four-passenger, four-cylinder" model, the 77 on a 100½ in. wheelbase with 51-in. tread, front and rear; and a "six-passenger, six-cylinder" chassis, the 99 on a 113-in. wheel base, and 58-in. tread.

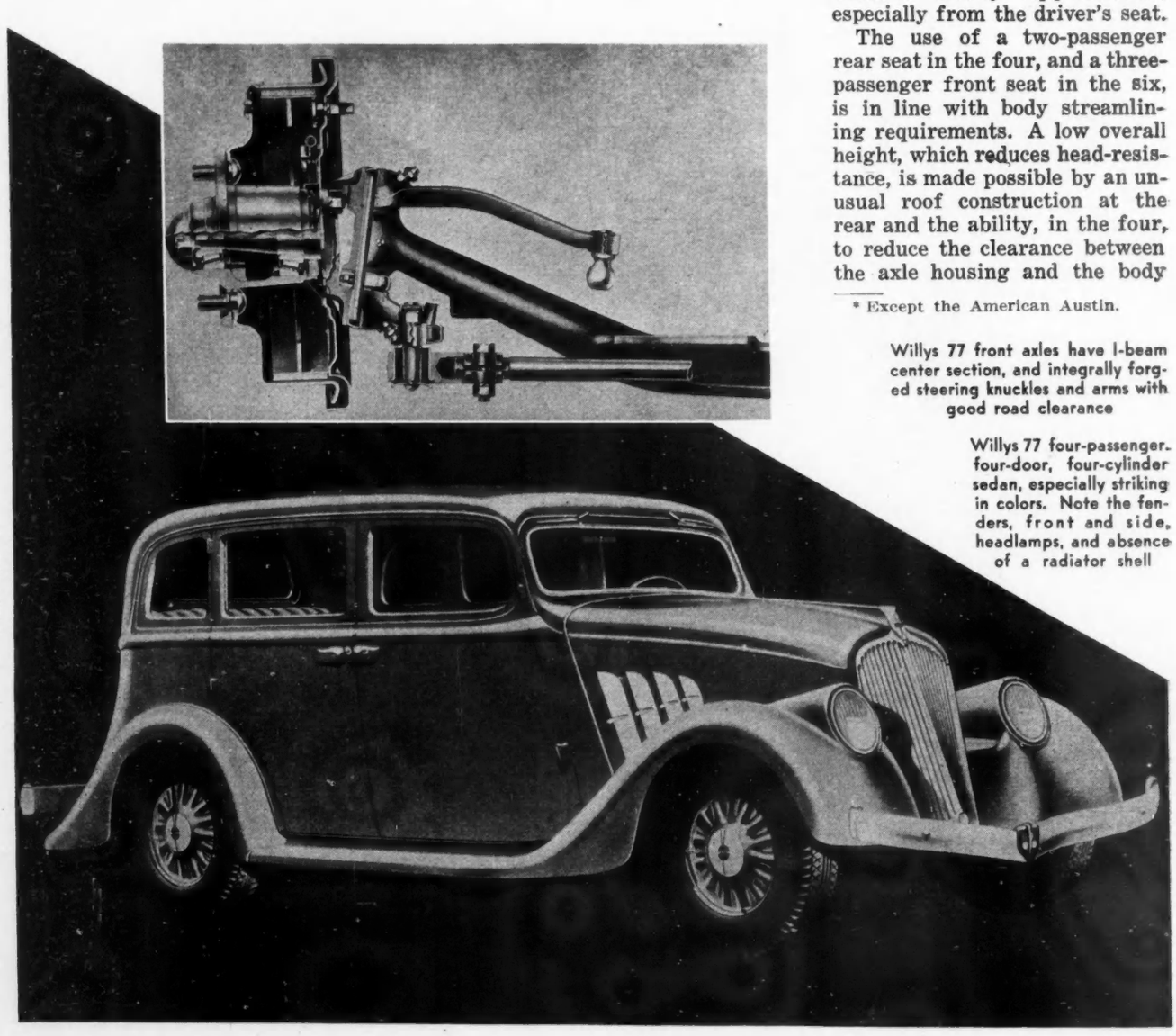
Both cars are similar in general design. The 77 is expected to have list prices well below that of any 1932 car.* Three body models, a coupe, a convertible roadster, and a sedan, are offered in both standard and "custom" lines, on both chassis. In addition, a cab delivery with pickup body, and a panel delivery body are offered on the four-cylinder chassis.

The new body lines are particularly striking when the finish is in one of the brighter colors. Hoods curve down toward the front, reducing head-resistance by directing the flow of air over the top of the body. A keel extending along the center of the hood, forward, prevents a "stubby" appearance, especially from the driver's seat.

The use of a two-passenger rear seat in the four, and a three-passenger front seat in the six, is in line with body streamlining requirements. A low overall height, which reduces head-resistance, is made possible by an unusual roof construction at the rear and the ability, in the four, to reduce the clearance between the axle housing and the body

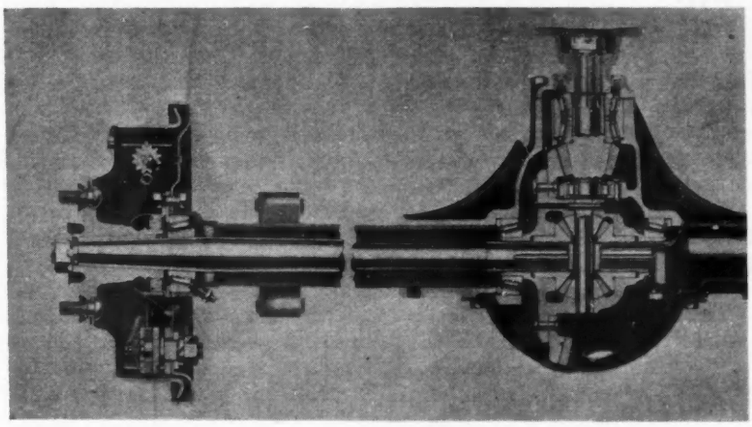
* Except the American Austin.

Willys 77 front axles have I-beam center section, and integrally forged steering knuckles and arms with good road clearance



Willys 77 four-passenger, four-door, four-cylinder sedan, especially striking in colors. Note the fenders, front and side, headlamps, and absence of a radiator shell

Lowest Prices With Streamlined Four



Section through the new Willys 77 rear axle

without an occasional "striking through."

Parts that ordinarily project from the body are in this design worked into the body, as in aircraft design. Wheels and tires are almost cowled by relatively short and skirted fenders. At the rear the spare tire is recessed into the body panel, which slopes backward from the top down. Headlamps are built into and streamlined in the fenders.

Windshields, of course, are sloped and have rounded header panels. Side panels and doors also have pronounced curves, the body being of maximum width near the belt line. The slope of the side windows, incidentally, should help to reduce glare. The effectiveness of the streamlining is said to be reflected by the lack of a blast of air into the body when the windows are down.

Wheels are of an unusual disk type, with a waved surface giving the appearance of spokes. Furnished by Kelsey Hayes, they are designed particularly for light weight.

There are no separate front and rear body splash aprons, and the running board, which is formed integral with a very low side splasher, not only is blended into the front fender but actually forms a part of it.

The new cars have a false radiator front well ahead of the actual radiator, and in line with the front edges of the fenders. Between the radiator front and the radiator, at the bottom, is a mud-splasher acting as an air scoop for additional cooling capacity. With the wide hood used to minimize wind resistance, considerable latitude is permitted with respect to the form of the radiator, and a simple rectangular core with a minimum of dead cells is employed.

Front door pillars and door edges are sloped, as are the four louver doors in the rear portion of the hood.

Bodies are virtually all-steel and are manufactured by Willys-Overland in its Elyria, Ohio, plant, with some body stampings purchased outside. In the cowl, separate braces are largely eliminated by the use of a box-type of construction, whereby inner and outer cowl stampings are welded together into one unit. Only a short section of the cowl is exposed, in which a cowl ventilator is located.

Body sills and cross sills are of steel, which makes for reduced overall height. Of steel also is the unit rear seat pan and rear floor pan. The former has a rubber diaphragm insert over the center of the axle housing. The sloping rear body panel is curved forward and extended to a point level with the front of the rear quarter windows in the sedan. Ahead of this there is the normal type of French roof construction, set down into the body. The additional headroom space over the rear seat gained in this way permits a reduction in over-all height at the rear of the car.

The steel panel roof section is insulated against drumming. Windshields are of the swinging type, operated by a central toggle control. Doors, it will be noticed, are hung on the sloping front pillar. With this design the doors, of course, drop when being opened, but the movement is slight, due to the location of the hinges. Draft protection is provided by a shallow curved body sill.

While the spare tire is recessed into the rear body panel, it is not carried by this panel. The slope of the body toward the rear leaves space between the body panel and rear seat back for braces extending up from the frame, to carry the tire and wheel. Studs for attachment project through the body panel.

A very simple group of instruments, consisting of a speedometer, an oil-pressure gage and a gasoline-level gage, is carried on the dash of the four, on the left-hand side. This is balanced by a glove compartment on the right-hand side.

The six carries three instrument groups, including, in addition to those on the four, an ammeter and an engine-temperature indicator. This car also has a Startix automatic starting device. On the four the starter button is located on the dash immediately above the accelerator pedal, so that the operator can depress

New Willys prices:

Series 77

2-Passenger coupe	$395.
Rumble coupe	425.
Custom rumble coupe	445.
4-Door sedan	445.
Custom sedan	475.

Willys 99 6-cylinder price range $595 to $695.

the accelerator with his heel while starting the car, eliminating the necessity of shifting the foot back and forth.

The interesting headlamps, with their sloping lenses, are spring-mounted in the fender by means of three screws, which also serve as a simple adjustment method for headlight beams, and for focusing. The spring mounting, it is claimed, results in a surprising increase in filament life. Another set of three screws serve to remove the lens for access to the lamp. A rubber ring protects the lamp against dust from the road. Hoods have a single central control handle.

On the standard models, sheet metal is finished in black, with black interior moldings and cloth trim. Deluxe models have the sheet metal finished to match the bodies, grained moldings, and mohair upholstery and trim. In the deluxe models, rear curtains are mounted at the bottom, on account of the slope of the rear panel, and are pulled up or let down by a remote control located in the headlining over the left front door.

The four-cylinder panel delivery has a single rear door, making possible the mounting of the spare tire and wheel in the door panel.

Performance and Economy

Both of the new cars have good performance and economy, due in part to the low weight, but even more to the streamlining. The shipping weight of the four-door, four-cylinder, four-passenger sedan is around 2090 lb. The engine develops its maximum power at a much higher speed than the Whippet engine a few years ago, the peak, it is said, being 48 hp. at 3200 r.p.m. A top speed of 71.5 m.p.h. is said to have been clocked.

Fuel consumption tests on the four are claimed to have shown 32.4 miles per gallon at 20 m.p.h., 27 at 40 m.p.h., and 20¼ at 60 m.p.h.

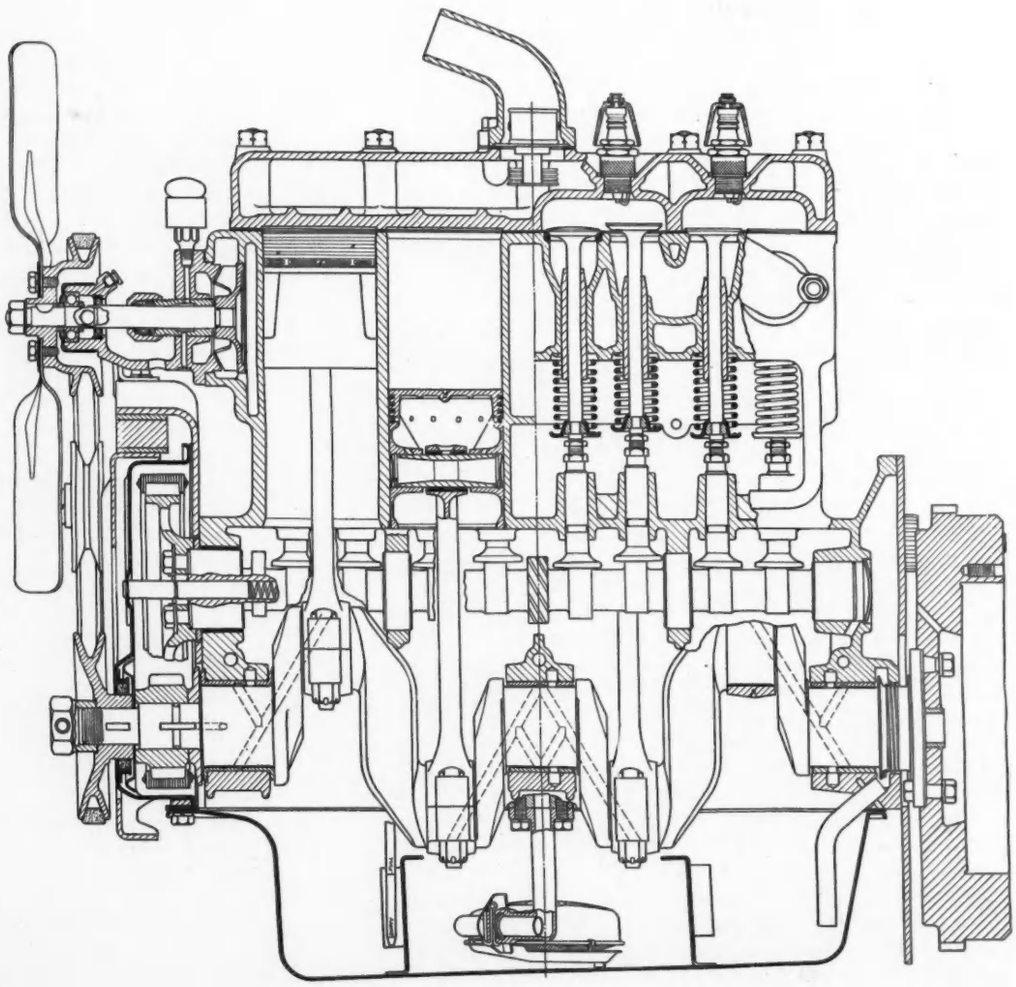
On the considerably larger six, with a shipping weight for the sedan of 2788 lb., and a road weight of 2885 lb., a maximum speed of 80 m.p.h. is claimed. It has an engine of larger capacity than the Willys six of last year, developing 81 hp. as against the former 67.

While the Whippet engine of a few years ago may be said to have been the prototype of the new Willys four, which has the same bore and stroke, the latter engine differs from it in virtually every detail. It has a "floating power" mounting under Chrysler patents. Torque reaction is taken care of by a rubber torque resistor located between the rear of the engine block and the right leg of the X-member at its junction with the side rail.

Numerous improvements in the details of the engine have been made. There is now a bronze bushing in the camshaft front bearing. Exhaust-valve seat inserts of high-speed tool steel reduce the effects of valve pounding. A combination air-cleaner and intake silencer of AC make is supported from the block by a special bracket. An AC fuel pump with strainer. Other new features include four-ring pistons; replaceable interchangeable connecting rod liners; thin-walled interchangeable, steel-backed main bearings; a vibration damper on the crankshaft, and pressure lubrication to all bearings except the piston pins.

Generator drive is by fan belt, and camshaft drive is through steel crankshaft and semi-steel camshaft gears. The distributor is mounted on an accessories cross-shaft, driven from the camshaft. Fuel lines are located outside the frame for protection against vapor lock, with flexible couplings in view of the use of flexible engine mounting. Exhaust pipes for the same reason are rubber-mounted. There is a manifold heater valve adjustable for seasonal changes. Spark advance is fully automatic.

The single-plate Rockford-Borg & Beck clutch incorporates helical springs in the hub. Clutch throwout is by a pantograph arrangement from the brake cross-



shaft which supports the pedals on this car. The throwout linkage incorporates a cable instead of a rigid link.

The very compact spur-gear transmission has Timken roller bearings on the main shaft. The unit is produced by Willys-Overland in its Elmira plant, which has been reopened.

Universal joints are of Universal Products manufacture. Rear axles incorporate a straddle-mounted pinion, shim-adjusted at the factory. Axle housings, gears and bearings are marked to permit ready selection of the shim thickness required. The forward bearing is a Hyatt roller, riding directly on the integral pilot shaft.

Differential side bearings are also shim-adjusted, and are Timken rollers. The axle housing is of simple, rigid, and economical design. It comprises a malleable center housing into which the axle tubes are driven and welded in place. Front axles are of I-beam section, a reversion from last year's tubular axle in Willys Overland cars. There are Timken roller bearings on the knuckle pins. Steering knuckles and arms are forged integral, and the general layout gives good front end clearance. With the layout used the drag link and tie rod are absolutely straight. The latter is nested between the engine and the axle, and has bonded rubber (Columbia Auto Parts) connectors. The steering gear, of the Saginaw Products roller-bearing worm type, is mounted on top of the frame side rail.

It will be noted that the two-shoe Bendix brakes are of the new "low velocity" type, the drum diameter being only 9 in. and comparatively wide linings are used.

Frames have kick-ups over both front and rear axles. The X-member is located in such a manner that it terminates at and serves to reinforce the frame at the rear spring hangers for the front springs and the front hangers for the rear springs. At the front there is a K member whose legs are extended back to form a box-section with the side rail, that is overlapped by the ends of the X-member forward leg. This forms a triple-thickness section approximately at the cowl, where the bending moment is near its maximum. Steering gear and engine torque reactor brackets are also located at this point, one on each side.

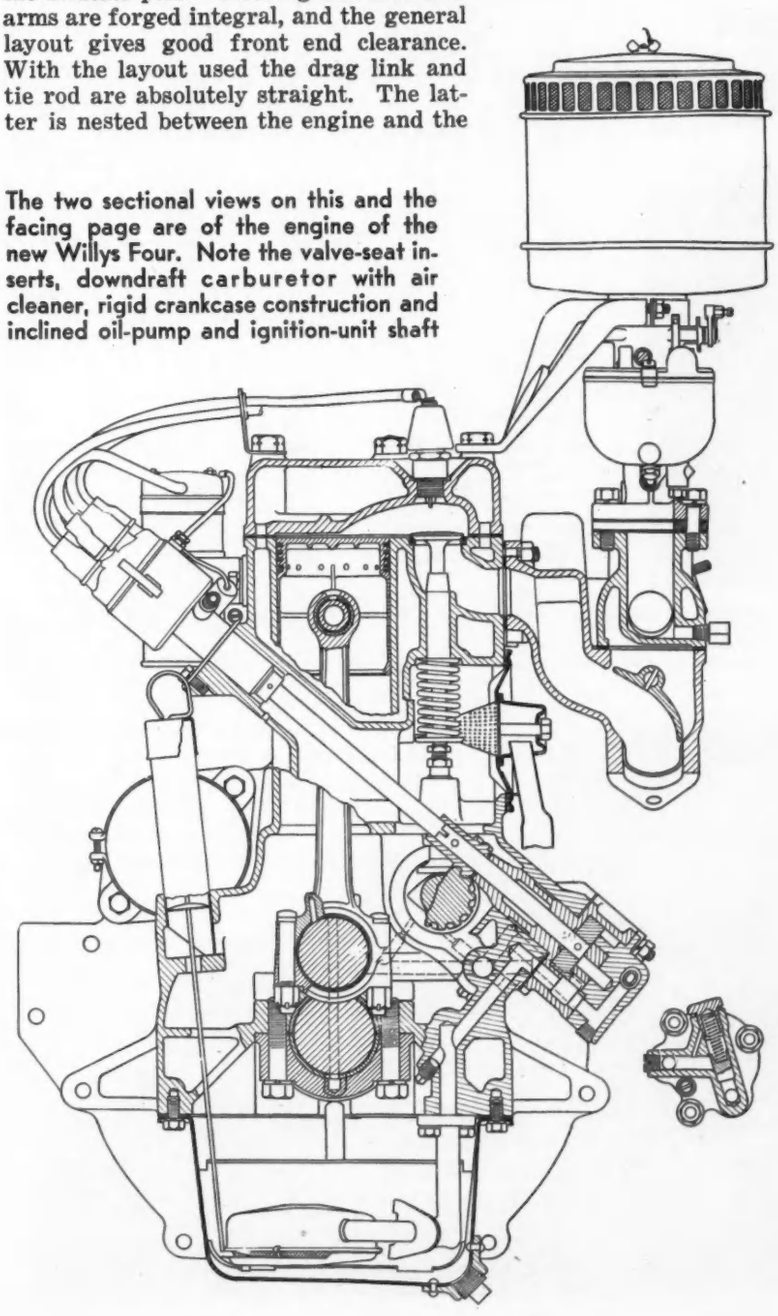
The spring suspension is conventional, and Tryon shackles are used. Four hydraulic shock absorbers are standard equipment. The fuel tank is concealed by the rear body panel, through which the filler spout projects. There are two cross-members at the rear of the frame, these being jointed by the stamped spare-wheel carrier.

Detail chassis weights are rather interesting. The front axle assembly complete with steering connections, etc., weighs only 48 lb.; a complete rear axle, 91 lb., and the frame, 117 lb.

Engines in the Willys 99 follow the general design of the previous Willys six more closely than four follows the Whippet. There is, however, little interchangeability between the two engines. Bore and stroke are 3 5/16 by 4⅞ in. as compared with 3¼ by 4¼ in. last year, the displacement of the new engine being 213 cu. in.. Maximum engine torque is now 150 lb.-ft. The standard axle ratio is 4.1 to one, while a ratio of 4.4 to one is optional for hilly country.

Details of design, differing from previous practice include "floating power" mounting, interchangeable connecting-rod liners in big ends, four-ring pistons, floating piston pins, thin-walled, interchangeable main bearings of the steel-backed type, exhaust-valve-seat inserts as on the four, heat control from dash, a new water pump, a new downdraft carburetor, and transmissions with integral bell housings.

The throwout mechanism for the clutch is similar to that on the four, except that there is a separate shaft for the pedal mounting on the frame. Transmissions have constant-mesh helical gears for countershaft drive and second speed, synchronizing mechanism for shifting, and a double stepped tooth design permitting lighter spring pressures for the synchronizer lock without danger of clashing. Freewheeling is optional, the unit supplied being of roller-cam design.

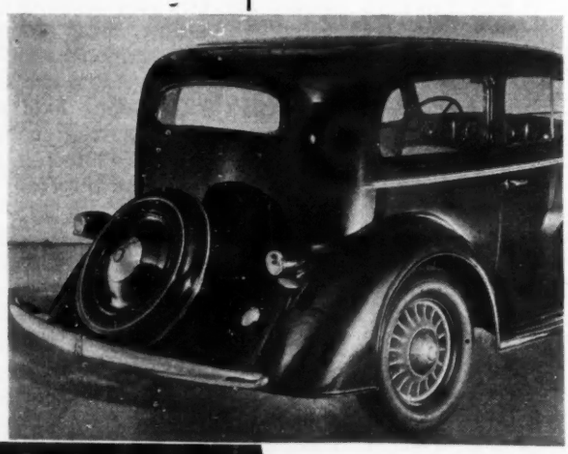


The two sectional views on this and the facing page are of the engine of the new Willys Four. Note the valve-seat inserts, downdraft carburetor with air cleaner, rigid crankcase construction and inclined oil-pump and ignition-unit shaft

Simplification Is Keynote of 1933

Six and eights have unusual fender design and long tapering hood louvers

Rear of the New Oldsmobile showing the striking molding treatment, and the radical new fenders blending with the deep rear splasher



Mechanical Data

	Six	Eight
Model designation	F-33	L-33
Wheelbase	115	119
Tread, front	58½	58½
Rear	60	60
Bore	3⅜	*
Taxable hp.	27.34	*
Displacement	221.4	*
Max. hp.	80	90
Comp. ratio, standard	5.3	5.5
Engine mountings	3	3
Main beargs. diam. front	2.478	*
No. 2	2.540	*
No. 3	2.665	*
Rear	2.728	*
Conn. rod beargs.	replaceable	replaceable
Piston pin diameter	.856	.856
Length		2 11/16
Piston, between bosses	*	1 7/16
Pin bush. length	1¼	1¼
Cooling thermostat	Yes	Yes
Fan bearing type	ball	ball
Fan make	own	own
Oil temp. regulator	No	No
Radiator shutters	No	No
Headlamp bulbs Mazda No.	1116	1116
c.p.	21-32	21-32
Fender lamps	No	No
Horns	One, under hood	
Clutch		
Outside diameter	9⅞	*
Inside diameter	*	6⅛
Wheels, type	steel-spokes-Kelsey-Hayes	
Rim width	3.25	*
Tire section	5.50/17	*
Steering ratio	16:1	*
Turning circle	39 ft.	42 ft.
Front spring length	35 in.	*
No. leaves	9	9
Bushing diameter	9/16 in.	9/16 in.
Rear spring, leaves	8	8
Frame type	double drop	X-type
Flange width, top	2½	2½
Bottom	2½	2½

Unless otherwise noted specifications remain as formerly: * indicates no change.

Three-quarter view of the new eight

Oldsmobile Line

by Athel F. Denham

A SIX and a straight eight are again offered by Olds Motor Works for the 1933 season, but this time on different wheelbases.

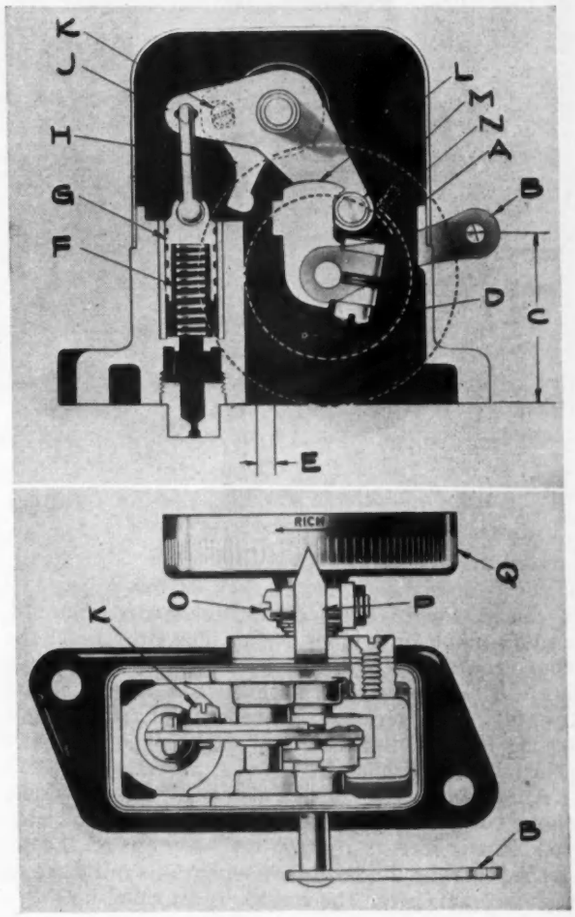
In appearance the new Oldsmobile line presents the most striking appearance of any of the various General Motors lines. In large part this is due to the highly unusual fenders employed, and the long tapering hood louvres. Mechanical free-wheeling is discontinued on both lines, the reason offered being that inspection of cars coming in for service or checking reveals that the great majority of owners do not use it. Instead, those drivers who desire the inclusion of free-wheeling may obtain an automatic clutch of the latest Bendix design, including the inertia cushioning valve to prevent surging, and the tapered metering valve as used on Cadillac cars and Buick for 1933. This clutch control is listed at extra cost but its installation is simple, as it is fully provided for in the design.

The oil temperature-regulator of the 1932 line also has disappeared, its elimination having been made possible, it is stated, by the adoption of thin-wall, steel-backed, babbitt-lined bearings in the big ends of the connecting rods, which bearings seem particularly effective in withstanding high-pressure loads at the comparatively low engine speeds in the Oldsmobile cars. These bearings are interchangeable, and, of course, obviate the necessity of re-babbitting rods in case of failure. Main bearings are of the same type and are removable without disturbing the crankshaft. This is effected by removing the cap, inserting a pin in the oil hole of the crankshaft, and rotating the crankshaft. The pin turns the upper half of the bearing out of its seat, the fore-and-aft locating dowel for this half riding in an annular groove in the outside of the bearing shell. Lower halves are doweled against turning, by a stamped projection in the steel shell.

Main bearings are line-reamed and stepped from front to rear as formerly, but it is stated that the shells are completely interchangeable, due to the line finishing of bearing bores with tungsten carbide tools before bearing assembly. Adoption of these bearings has made possible an increase in main-bearing diameter.

Detail changes have been made in the 1933 carburetors to improve starting, prevent surging, and make idle adjustment less sensitive. To prevent gasoline from draining back into the fuel pump, the float needle valve is now placed in a horizontal position, which also makes it more immune to rod shocks. Hard starting when the engine is hot is often due to fuel leaking through the high-speed jet. This has been corrected by locating this jet above the fuel level and providing a by-pass for excess fuel back to the float chamber.

Improvements have been made also in the automatic choke pioneered on the 1932 Oldsmobiles. This choke, it will be remembered, was controlled by inlet manifold vacuum insofar as tripping the locked position was concerned. When the engine started, a piston was pulled down, permitting the thermostatic element to control the choke opening. Occasionally the piston would come down too far, and the choke, therefore, would open too far. This has been corrected by adding



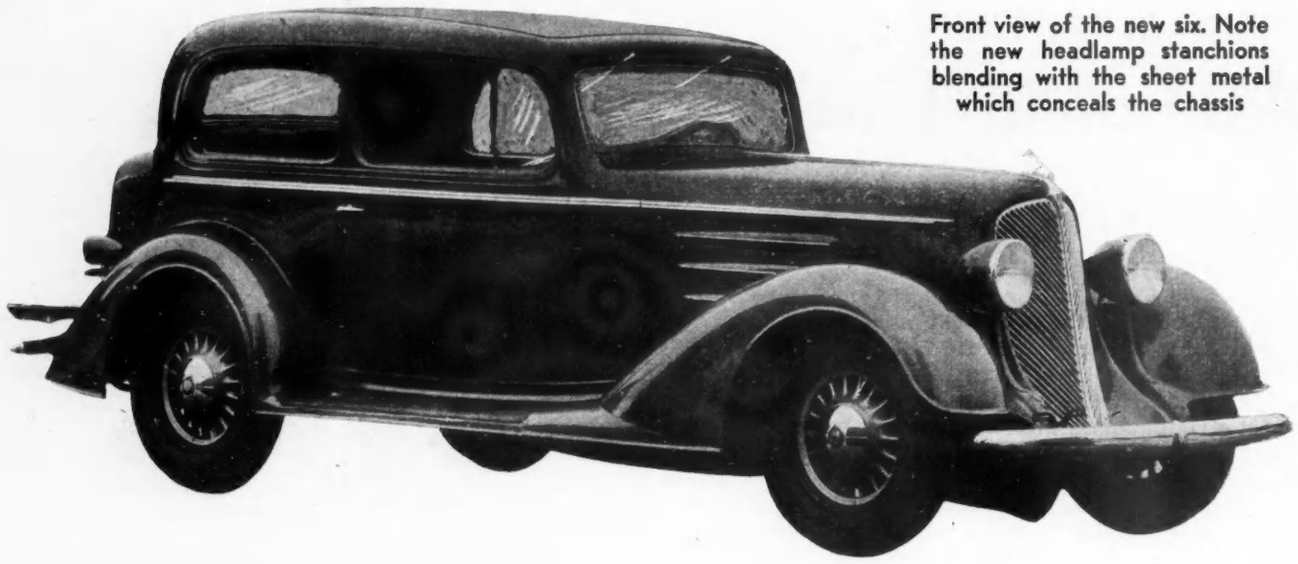
Two sections through the re-designed automatic choke on the 1933 Oldsmobiles

When the engine becomes cold and the thermostat A reaches a temperature of approximately 70 deg., the choke valve in the carburetor returns to the closed position. It remains closed during the cranking of the engine and is held so by the locking of roller M, against cam L. When the engine fires and a manifold vacuum is created, vacuum piston G is pulled partly down, unlocking cam L and roller M. As soon as the engine fires steadily and an even vacuum is present, piston G travels the remaining distance. Lever H then comes in contact with cam L, opening the choke valve a pre-determined distance against the tension of the thermostat spring. When the engine has reached a water temperature of 120 deg. the choke valve is in wide open position.

The Prices Are—

6-cylinder business coupe	$745
5-passenger coupe	745
Sport coupe	780
4-door sedan	825
5-passenger touring coupe	775
4-door touring sedan	855

Eight has same body models and prices just $100 higher.



Front view of the new six. Note the new headlamp stanchions blending with the sheet metal which conceals the chassis

a check stop to the lock-up linkage, similar to the second notch on a door lock. The first notch in the choke control opens the disk sufficiently for easy starting. The second notch permits a slight additional opening, and, therefore, prevents too hard starting due to too lean a mixture. Beyond this point the choke position is controlled by the thermostatic element.

A hardened steel cam is also provided on which the choke control lever rides after the engine has warmed up. This prevents up-and-down motion of the piston in the control cylinder due to variations in intake manifold vacuum, after the engine is warmed up.

Simplification is the keynote of the 1933 Oldsmobiles, especially as far as operation is concerned, and radiator shutters also have been eliminated. These have been made unnecssary by the provision of a thermostatic valve.

The thermostat, of the bellows type, is located in the cylinder head. A spring-loaded by-pass valve is located within a casting fitted to the top of the water pump body at the front of the engine. With the water cold, and the engine running, the by-pass valve opens under pressure permitting the water to return to the cylinder block. As the water warms up, and the thermostat opens, the by-pass valve also gradually closes sending all the water through the radiator.

While high and low compression heads are available on the 1933 Oldsmobiles, the low compression head is "standard." Whereas last year the difference ratio was largely a matter of gasket thickness, this year there is a difference also in the two heads.

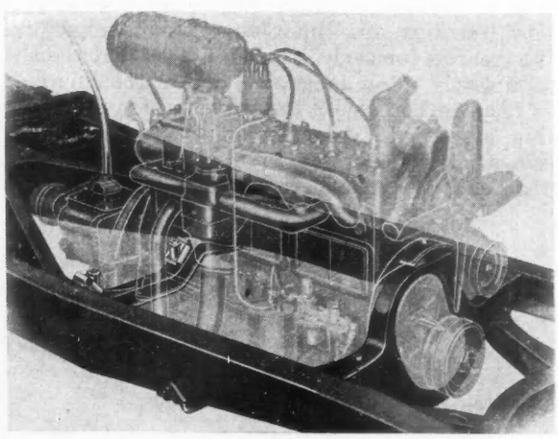
Engine mounting is of the three-point type, with the front support just under the water pump. A plane through these mounting passes through the center of mass of the engine, it is stated, and therefore includes the "neutral" axis about which the engine can oscillate slightly under torque reaction, etc. The front support is located on a separate cross-member of the frame, which is cut out for clearance for the timing chain housing. This member is removable with the engine. Rear supports are at an angle, and in effect portions of an imaginary circular track in which the power plants rests—as on runners. The rubber is confined so that the only movement permitted is along this circular "track," and not forward and aft.

A reduction in overall height has been achieved through the use of double drop frames. By increasing the tread at both front and rear and using a wider rear spring spacing, it has been rendered unnecessary to reduce the seat width. An X-type cross-member characterizes the new frames, with the forward legs extended in the side rails to the front cross-member. At the front they curve inward to form a K member at the front end. These changes in design have lowered the bodies 2⅞ in.

Steering has been made easier by detail changes, and a kick-shackle has been added at the left front spring at its forward end. Shackles this year are of the threaded type. Shock absorbers are double acting hydraulic.

Brake hook-up has undergone considerable alterations. The adoption of the X-member frame has made possible the installation of a short cross-shaft between the forward legs of the X. From this shaft cable

(*Turn to page 32, please*)



Phantom view showing the location of the new engine mountings on the Oldsmobile six. A similar mounting is used on the eight. Note also the front axle kick-up in the frame and reinforced side-members

JUST AMONG OURSELVES

The Diesel List Grows

SIX American truck makers are now building standard Diesel-engined models as part of their regular lines.

The six companies which are pioneering the Diesel trucks commercially in this country are Gramm, Gotfredson, Indiana, Le Moon, Sterling and Kleiber. All of the Diesel-engined models offered are relatively heavy jobs, the capacities ranging from 3 to 18 tons. The Gramm 4-cyl. model, for example, is rated at 3-4½ tons and its 6-cyl. model at 5-7½ tons; the Indiana model at 5-7 tons; and the thirteen Sterling models — all sixes — range from 5-18 tons.

All of these, incidentally, are powered by the Cummins H powerplant which comprises 4 or 6 cylinders with bore and stroke of 4⅞ x 6. The six is the same powerplant which was carried in the reconditioned Mack bus with which the Cummins organization just made a run from New York to Los Angeles in 78 hrs. and 10 minutes running time.

Class Distinction In the Knowing

WE don't know where this one started, but it came to us from J. S. Hildreth, Chilton's vice-president and general sales manager, who had it of Laurence Woods, sales manager of Colonial Steel Co. At any rate we know you'll join us in thanking Messrs. Hildreth and Woods for passing along the most erudite and perspicacious description of the difference between a salesman and an engineer that has ever been writ down. Here it is:

> "An engineer is said to be a man who knows a great deal about a very little, and who goes along knowing more and more about less and less until finally he knows practically everything about nothing; whereas a salesman, on the other hand, is a man who knows a very little about a great deal, and keeps knowing less and less about more and more until finally he knows practically nothing about everything."

And They Still March On

JUST finished ten minutes of reminiscing over a list of chief engineers of passenger car companies for 1925 which bobbed up during our bi-annual cleanup of the files in the bottom right-hand drawer of our desk. Surprisingly large number of men who headed up the engineering departments seven years ago are still carrying the flag, despite the radical upward and downward swings of business, managements and sales during this period.

The list—believe it or not—contains 51 names. Of that group, 23 of the companies are no longer in business.

Ten men who headed the engineering departments of the remaining 28 companies in 1925 still head the same departments of the same companies as 1932 closes, and several more have been advanced to higher positions in the same firms. The sturdies who appear among the ten on this "then and now" list include *Seaholm* of Cadillac, *Zeeder* of Chrysler, *Ferguson* of Cunningham, *Marks* of Franklin, *Watts* of Hupmobile, *Wahlberg* of Nash, *Anibal* of Oakland-Pontiac, *Baker* of Willys-Overland, *Vincent* of Packard and *Thomas* of Reo.

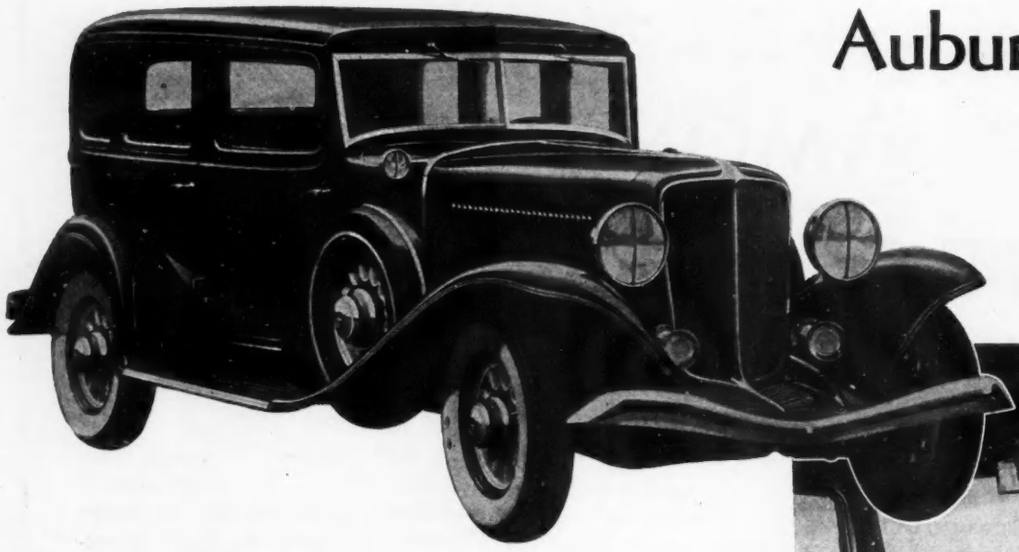
And whether it means anything or not, all except one of these ten are readers of *Automotive Industries*, and all except one are members of the S.A.E.

Jim Crawford who topped Auburn's technical staff in 1925 is batting at the top of the Chevrolet list now, while O. E. Hunt, Chevrolet's 1925 engineering chief has moved up to a G. M. vice-presidency. And over at Auburn, in the positions of vice-president in charge of engineering and chief engineer, respectively, we find Herbert Snow (Velie '25) and George Kublin (Moon '25).

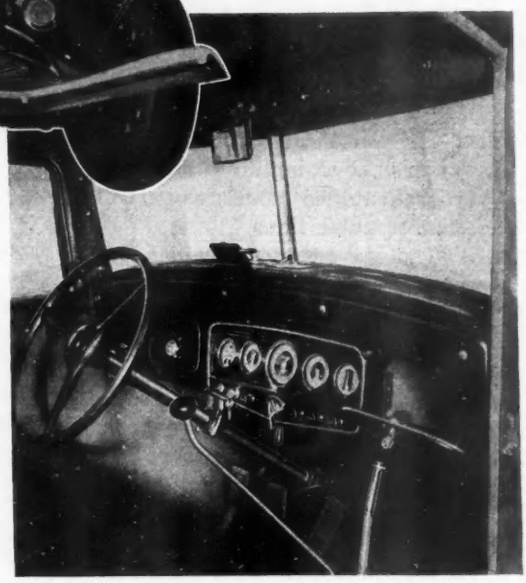
The old 1925 list showed Carl Neracher, now part of the Chrysler organization, as functioning at Durant Motors and Russell Begg, now engineering head of Midland Steel Products, as Jordan's chief engineer. Others prominent then, are doing equally important work now in different companies.

Well, here goes that old list into the waste basket. We'll have to compile a new one the next time we start out to bother our technical friends with new questions or inquiry. All we can say is that the comparison of the two lists and of the products manufactured in 1925 and 1932 indicates that we have in automotive engineers probably the finest combinations of stability and imagination, of balance and dynamic progressiveness that the world of industry ever has known.—N. G. S.

Auburn Includes



Auburn 1933 Salon 5-passenger sedan



Front compartment of the new 12-165 Auburn Salon model

The instrument panel with background in black and chrome. Operating instruments are visible on edge-lighted glasses. The large refreshment compartment to the right has lock and key. Walnut finished shelf behind windshield also has two containers. Steering wheel column and bracket are in chrome

TWO new cars, the Salon eight and the Salon twelve, have been added by Auburn Automobile Co. for the 1933 season. The "standard" and "custom" lines of eights and twelves are continued at prices only slightly above those current during recent months. Such price increases as have been made, ranging from $70 to $120 on the eights, and from $170 to $220 on the twelves—with the faster-moving models increased the minimum amount—are the direct result of a desire on the part of the factory to provide dealers with a wider working margin between wholesale and retail lists, thereby improving the dealer's profit possibilities.

The two "Salon" models added to the line were developed from the Auburn eights and twelves of the past two years. Engines, transmissions and axles (including the improved dual ratio mechanism) are continued in the new models without material change, while most other parts are new.

Bodies are new and striking, with new front ends, metal roof side, upper rear and rear-quarter panels, and new molding treatment. The entirely new frame looks about as rigid as anything on the market today, and in combination with struts tying the fenders to the radiator and a new method of cowl bracing, imparts much greater stability to the new cars, in spite of a more flexible engine mounting.

The new frame, which is common to both the eight and the twelve, retains the X-member used by Auburn for two years past. From the points where the forward legs of the X attach to the side rail there extend two diagonal members, which meet at the center of the frame at a new cross-member tying the front spring horns together. These diagonal members pass under and are riveted to the radiator-carrying cross-member above the front axle, forming a letter "A," hence the designation "X-plus-A" frame.

At the kick-up over the rear axle where the weakest point of the frame is usually located, there are virtually two side rails, the inner one of which forms another slightly diagonal member toward the front and a box section with the side rail over the rear half of the kick-up.

The front A-member and spring horn cross-member are effectively concealed by a splash pan curving forward and downward from the bottom of a new radiator front, which has vertical grilles on the Salon eight and predominantly horizontal grilling on the Salon twelve. This splash pan follows the frame side rail curve and is embossed in a manner resembling diagonal louvers. The filler is now located under the hood. On the twelve the grille is of stainless steel.

A stainless steel molding is carried all around both front and rear fenders, outlining these parts, and reinforcing and protecting them against fender scratches. The chrome outline for the radiator front terminates in an elongated Vee at the bottom, extending over the front splasher. Fenders are tied to radiator shells with chrome braces, rubber insulated for a further steadying of the front end. Dual horns are provided; on the twelve they are mounted on the spring horns and on the eight below the chrome headlamps.

A chromium molding is used on these cars also in the upper half of the body sides, running horizontally above and below door and rear-quarter windows and paralleling the window lines at the windshield pillar

Striking Salon 8's and 12's for 1933

by Athel F. Denham

New Prices on the Standard and Custom Lines

Body Model	Eight		Twelve	
	Standard	Custom	Standard	Custom
	127 in.w.b.		133 in.w.b.	
Coupe	$745	$895	$1145	$1295
Brougham	795	945	1195	1345
5-pass. sedan	845	995	1245	1395
Cabriolet	895	1045	None	1445
Phaeton-Sedan	945	1095	None	1495
Speedster	...	1095	....	1495
	135 in.w.b.			
7-pass sedan	945	1095	....	....

Prices on the Salon series are not yet available; it is expected that they will be some $200 above those of the custom eight and twelve.

and back of the rear-quarter window.

Cowls, as mentioned, are entirely new also. The most striking feature is the adoption of a pointed front roof header bar with one-piece, swinging, V-type windshield. One-piece construction makes possible the use of a relatively narrow chromium-plated center strut for joining the two halves of the shatterproof windshield glass. Hinges are concealed and of the "hook-over" type, on account of the V-shape. Operation of the windshield is by a single central toggle control, which in the closed position nests in a depression in a fairly wide ledge at the base of the windshield.

The cowl structure has been reinforced by the use of triangulating struts. Two tubular struts extend nearly horizontally from the front-door pillars to a point centrally on top of the dash, and two others from this point forward and downward to the frame side rails (on the left side close to the steering-gear mounting). The struts are welded to the dash.

Much work has been done on the doors to eliminate the possibility of rattles. There are dovetails at the top of the door as well as at the front pillar, and several rubber bumpers are used.

Windshield wipers, of which there are two, have concealed mountings for motors in the roof header. Front seats have a ball-bearing type of adjustment. There are concealed vanity and smoking sets in the rear compartments.

Interiors as a whole and in detail represent a marked advance over anything offered by Auburn previously. There are wide wood-finish garnish moldings completely finishing off the upper interior side panels above and below the windows. On the twelve these are in two-tone finish, with steering wheel, robe rail, dome and reading light trim, etc., to match. Catalin knobs are used on hardware on this model, including the chain-type pull for the concealed zipper-fastener door pockets. There are windlaces all around doors for draft protection and neatness. On the twelve the foot rest is of the panel type, folding into the front seat when not in use.

Additional features on the twelve include a new instrument panel with "edge lighting" for the dial faces. The numerals are engraved in the dial glass (back of the convex protecting lenses), and light from four bulbs enters through the edge of this glass in a manner seen recently in some clock faces and window display advertising signs. There is also a universally adjustable sun-visor.

On the dash of the twelve is a new control for brake adjustment. This model carries a B-K booster mechanism to assist the new hydraulic brakes, and the amount of booster action is regulated by this pointer control. It has four positions, marked respectively, "Dry Weather," "Rain," "Snow" and "Ice."

Major mechanical changes on the twelve consist of the following:

Adoption of a new carburetor cross-shaft, back of the carburetors, permitting better synchronizing and individual adjustment of the two units.

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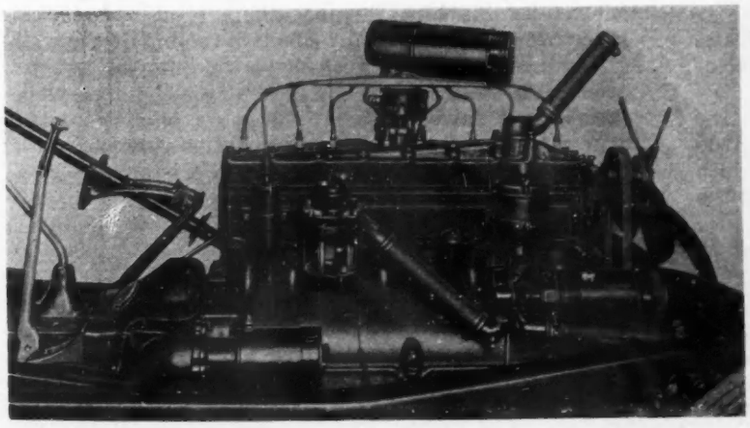
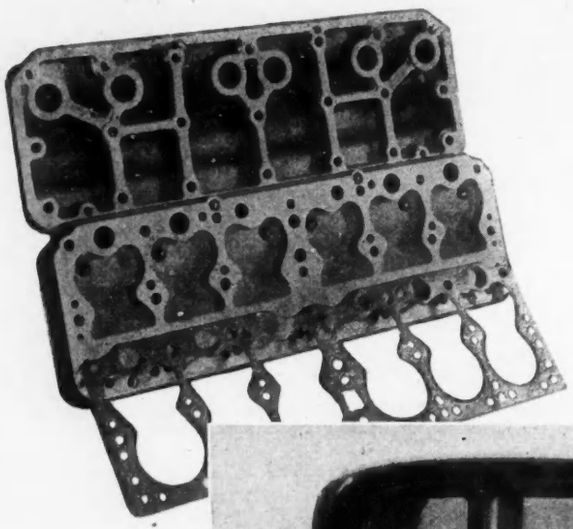
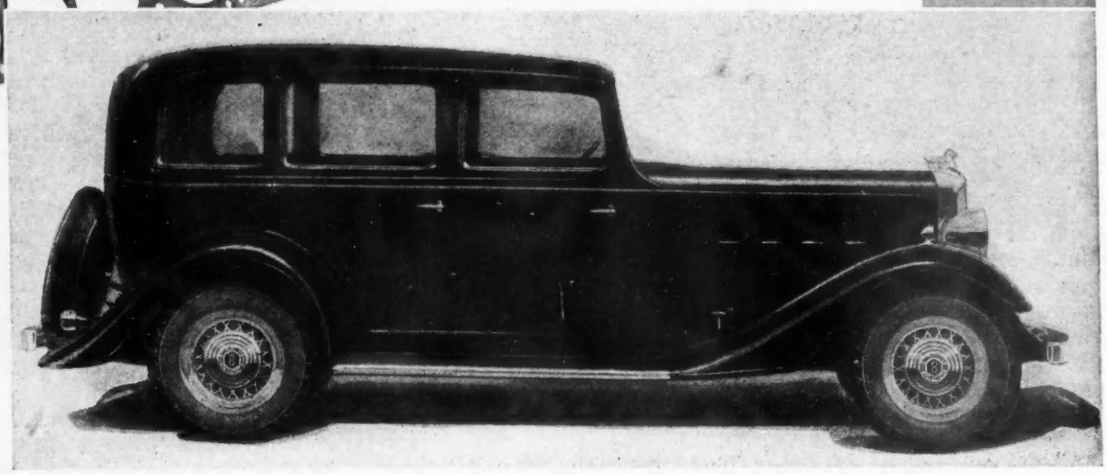


A straight-eight of 100 hp. coupled with dual ratio powers the smaller Auburns

Four Cars Usher Hudson-Terraplane Lines Into 1933 Market



New two-piece aluminum and iron cylinder head adopted for the 1933 Hudson Super 6



Low long lines characterize the 1933 Terraplane 8 sedan

FOR 1933, the offerings of the Hudson Motor Car Co. consist of four cars: the Terraplane six, improved in detail; a Hudson super-six on a 113-in. wheelbase chassis, in place of the former Essex Super Six; the Hudson eight on wheelbases of 119 and 132 in., the 126-in. length being dropped; and a new addition to the line, the Terraplane eight.

The new Terraplane eight, on a 113-in. wheelbase, carries the low-weight-per-horsepower fundamental of the Terraplane six design a step further.

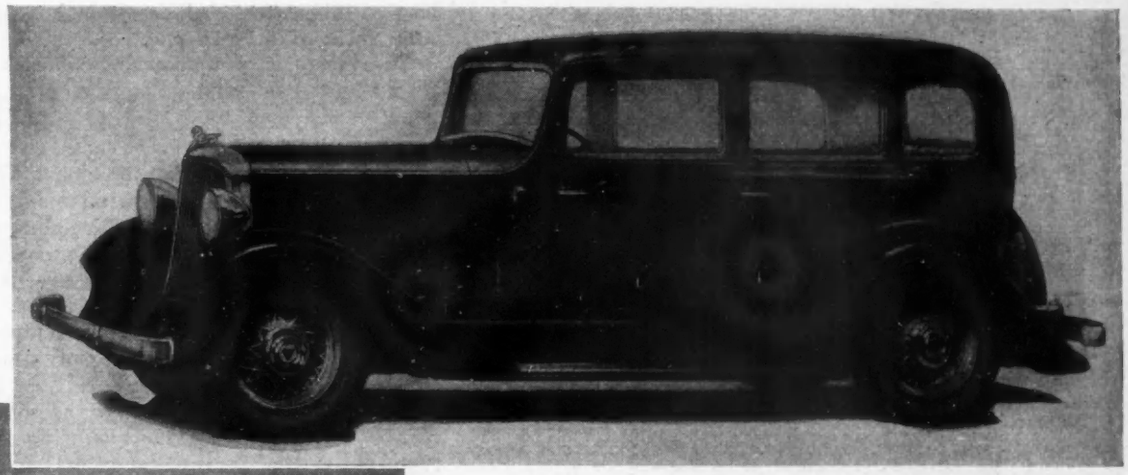
It has an engine, evidently based in design on the Hudson eight, that is claimed to develop 94 hp. at 3200 r.p.m. It has a bore of 2 15/16 in., as compared with 3 in. for the Hudson eight, and the same stroke as the latter, viz., 4½ in.

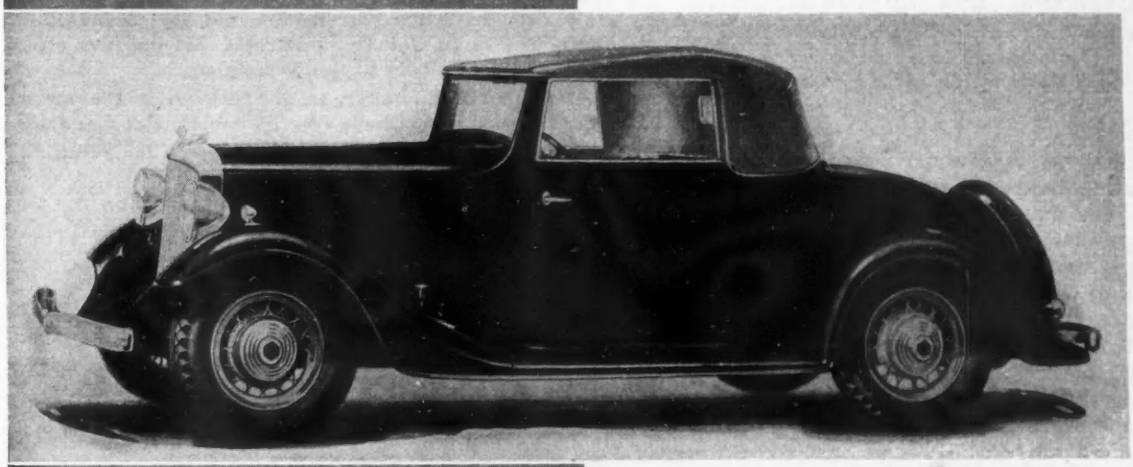
It is stated by factory officials that the weight of the standard Terraplane eight sedan, ready for the road, is 2750 lb., which gives a specific weight of well below 30 lb. per hp., and this low weight/horsepower ratio accounts for remarkable hill-climbing ability and acceleration. Bodies supplied on this chassis include a sedan, coach, coupe with and without rumble seat, and a convertible coupe. A top speed of 82 m.p.h. is claimed.

Engine mounting is similar to that of the Terraplane Six, assuring a limited degree of flexibility. The compression ratio is 5.8 to one, and the combustion chamber is of the form developed by Hudson, the characteristics of which are that there is a large jacket space over a high dome for effective cooling of the wall of the latter; that the fresh charge on entering sweeps over the hottest part of the combustion-chamber wall, the exhaust valve, and that the spark plug is located over the hottest part of the combustion-chamber wall. Spark plugs are of the 14-mm. type. Pistons are of a silicon-aluminum alloy and carry four rings each, the two lower being of the oil-control type.

Hudson

The lubrication system includes a crankcase ventilator. A downdraft carburetor and manifolding are fitted. Means of heat adjustment, located on the manifold, is of the seasonal type. A combination air cleaner

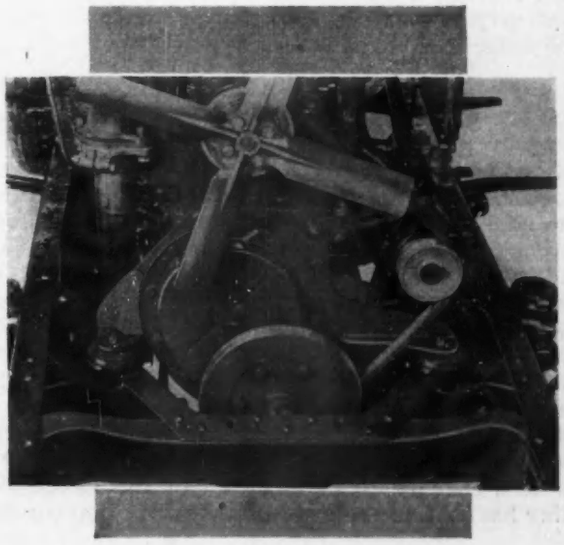




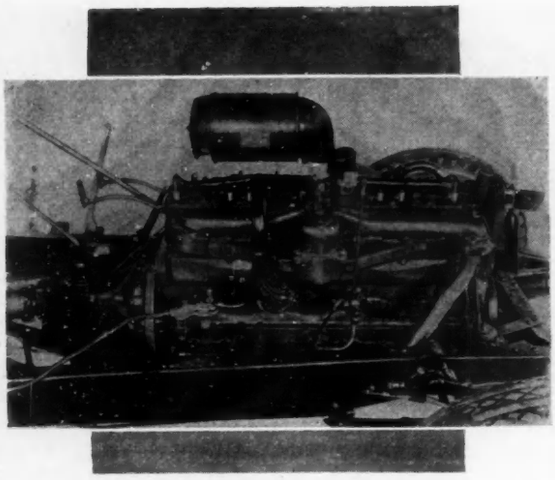
and silencer is standard. Fuel tanks hold 16 gallons and the fuel line to the pump is carried outside the frame. Choke and throttle are interconnected for easy starting, and the choke is rendered partly inoperative after starting by means of an "unbalanced" design of butterfly valve. Electrical units are Auto-Lite manufacture, the ignition system including a double-breaker distributor and full automatic advance. There is a graduated timing scale (inches advance on flywheel) on the distributor, for ease of adjustment. Batteries have 15 plates, and generators are designed to maintain a relatively high-charging ratio at high as well as low speed.

The clutch is of the characteristic Hudson cork-insert type, incorporating a spring cushioned hub one in. larger in diameter than on the Terraplane six. Transmissions follow the Terraplane six design, with wider gears, improved pressure angle for the gear teeth, and better steel (S.A.E. No. 3440).

Springs are splayed and mounted in silent-U threaded shackles. Two-way shock absorbers with thermostatic control are fitted. Frames of the X-member type have side rails of 1/32-in. heavier stock than those on the Terraplane six. Front axles are similar in design to those on the six, but the center section



Front motor support and box girder engine frame of the Terraplane 8



Down-draft carburetion is used in the new 8-cylinder Terraplane

curves in the reverse direction. This arrangement places the vibration damper slightly ahead of the front axle, with the Vee-shaped radiator core well ahead. The use of a Vee-shaped core on this car is an interesting departure. Radiator fronts follow the core lines.

Steering columns are adjustable to five positions. Tires, which are mounted on the new small 16-in. wheels, are of 6.00-in. section. In connection with the more flexible engine mounting, the clutch throw-out shaft design is of interest. The shaft has a spherical support with narrow bearing in the bell-housing, which permits the limited universal action.

Brakes are of the "low-velocity type" as on the six, with 9-in. drums and 2¼-in. lining width; they are cable-operated. Body and frame assemblies follow closely the practice adopted for the Terraplane six, there being 19 points of attachment. Frames have a maximum depth of 6½ in. A reinforcing sub-frame opposite the engine is used to strengthen the side-rails.

Hudson

Externally the bodies are characterized by door-type hood louvres, a Vee-shaped radiator front, and fenders carrying the modern "skirts" to conceal the chassis and protect bodies against road-splash from the wheels.

Terraplane Six

Improvements in the Terraplane six include the adoption of a wider (56-in.) tread, and of skirted fenders similar to those on the Terraplane eight. Modifications for the sake of improved appearance have been made in body contours, and the external visor has been dropped. There is a Griffin on the radiator filler cap.

Axle shafts have been increased in diameter 1/16 in.; alloy-steel gears are used in the differential, and bakelite thrust washers are provided in the differential assembly. An increase in strength of 30 per cent is claimed for the axle. The propeller-shaft diameter has been increased ¼ in. to 2¼ in. The steering ratio has been changed to 15 to one. An outside alemite fitting has been added to the clutch thrust bearing, for ease of lubricaton. All cars now have a standard rear-axle ratio of 4.11 to one.

Thermostatic double-acting shock absorbers have been adopted as standard equipment.

Hudson Six

The six-cylinder Hudson model also carries the skirted fenders, visorless windshield header, a more sloping windshield, and the Vee-shaped sloping radiator front; it has conventional hood-louvres.

Cylinder heads in this model are of the new Bohn composite type, of aluminum and cast iron, which are said to permit of the use of a compression ratio of 6.2 to one without recourse to premium fuels. With this new head, the output rating is 73 hp. at 3200 r.p.m., an increase of three hp. as compared with the former Essex six. Engine mounting is of three-point type, as on the Terraplane models, with two rubber-cushioned supports at the front, and one at the rear.

The frame is similar in design to that of Terraplane eight (of the same wheelbase), but has a maximum depth of 7⅜ in. for the side-rails. It has five cross-members in addition to the X-member.

An important change in the engine is the switch from chain to gear drive for the camshaft. Generator drive is now through the fan belt. A fuel pump also has been adopted for this model.

There is a larger (16-gallon) tank than on the former Essex six. Free wheeling and synchronized shift, with helical gears for countershaft drive and second speed, are transmission features.

An option is offered on two rear-axle ratios, 4 7/11 and 5.1 to one. Rear axles have shim-type pinion adjustment. A new leather oil seal is provided. Steering gears have a 15 to one ratio and are preloaded to combat shimmy, tramp, and wheel fight. The gear includes a shock-absorbing drag-link and a foreshortened steering arm. Tie rods are rubber mounted. Tires are 5.50/17 in., and are, therefore, of larger section, on smaller wheels, as compared with the 1932 Essex Super six equipment.

Body models on this chassis include a sedan, coach, coupe with and without rumble seat, convertible coupe, and a phaeton.

Hudson Eight

The eight-cylinder Hudson line is essentially the same as for 1932. The 126-in. wheelbase model has been discontinued, and four body types are offered on the 119-in. and five on the 132-in. wheelbase. These are sedan, coach, coupe and convertible coupe on the 119-in., and brougham, club-sedan, touring sedan, seven-passenger sedan and seven passenger phaeton on the 132-in.

The most important design change in this car consists of the adoption of a more flexible engine mounting, similar to that on the other models, with two "pneumatic" rubber supports at the front, and one at the rear.

Appearance has been improved by rounding the body at the top of the windshield. Running boards, radiator shell, ornament and grille also have undergone refinements, and fenders carry the new skirts and have more sweeping lines.

Bendix-Kliesrath vacuum booster brakes are fitted to these cars as standard equipment.

By the adoption of adjustable windshield wings and a new method of rear-quarter window control, Hudson Motor Car Co. has added a ventilating system to its sedan models. Front windows raise and lower in the

Hudson-Essex Prices

TERRAPLANE 6 STANDARD MODELS:

Roadster	$425.	(unchanged)
Business coupe	495.	(up $25.)
Coach	515.	(up $40.)
Rumble coupe	545.	(up $35.)
Sedan	565.	

SPECIAL TERRAPLANE 6:

Roadster	$525.	(unchanged)
Coach	555.	(up $40.)
Rumble coupe	580.	(up $70.)
Sedan	605.	(up $15.)
Convert. coupe	605.	(down $5.)

TERRAPLANE 8—all special models:

Business coupe	$645.
Coach	650.
Rumble coupe	685.
Sedan	725.
Convert. coupe	725.

HUDSON 6:

Business coupe	$765.	(up $105.)
Coach	795.	(up $130.)
Rumble coupe	815.	(up $105.)
Sedan	865.	(up $130.)
Convert. coupe	915.	(up $70.)
Phaeton	835.	(up $70.)

(Note—Comparisons are with 1932 Essex 6.)

HUDSON STANDARD 8:

Coach	$1,075.	(up $50.)
Rumble coupe	1,095.	(up $50.)
Sedan	1,145.	(up $50.)
Convert. coupe	1,245.	(down $50.)

Hudson Major 8

touring sedan	1,395	(down $50.)
Seven pass. sedan	1,495.	(down $50.)
Brougham	1,495.	(unchanged)
Club Sedan	1,495.	(unchanged)

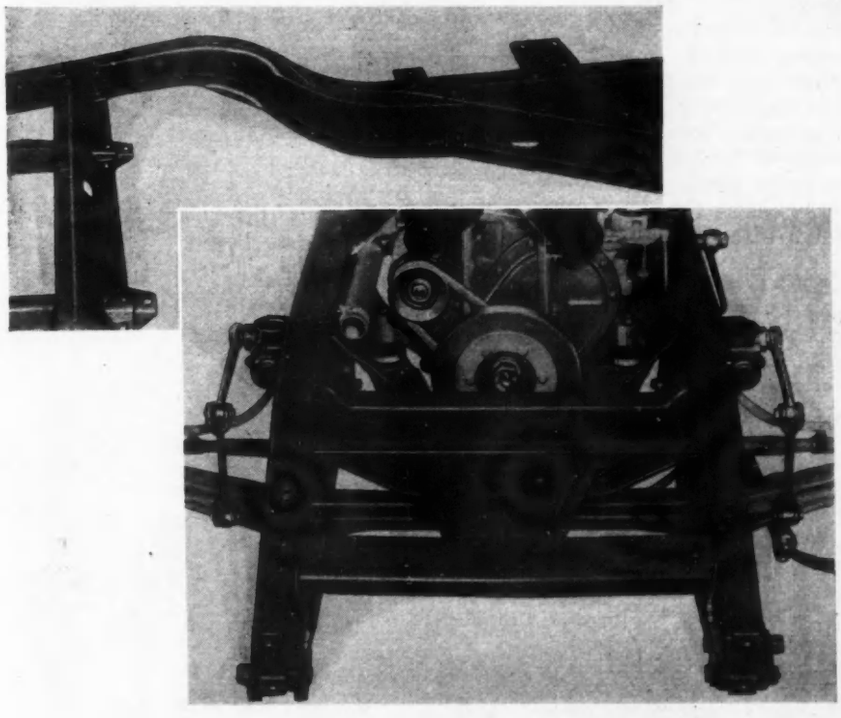
usual way, and wings are pivoted on the front pillar in such a manner that they can be set either to prevent the entry of air through the open window, or to act as an air scoop to force air into the body.

Rear-quarter windows, instead of being raised and lowered, are slid horizontally by the window crank. A study of air pressures outside the body revealed an average vacuum of 0.4 in. of water column just back of the front pillar of the rear-quarter window. By opening this window by sliding it back, the air is evacuated from the body by suction.

Front windshield wings can be set parallel with the car windows if desired, to reduce head resistance, and they do not interfere with the normal operation of the front windows in any way. Swinging windshields and cowl ventilators are retained.

Auburn Includes 8's and 12's for 1933

(Continued from page 11)



Close-up of the front end of the Auburn 8-105 chassis frame showing the bridge-like construction of the new "A" type cross member and the method of engine mounting

Adoption of an all-metal Purolator oil filter of the cleanable type, requiring no cartridge replacement.

"Air-cushioned" four-point engine mounting of the Firestone biscuit type.

A new type of LGS free-wheeling unit of the single-pocket type.

Improved planetary gears for the dual-ratio axle for greater quietness.

Hydraulic brakes, supplemented by mechanical hand brake application of the rear-wheel brakes. Drums are 14 in. in diameter, linings 2 in. wide.

Centrifuse brake drums, riveted as well as welded to backing plates. The latter have convolute instead of straight faces.

Adoption of Trayor threaded anti-rattle shackles, produced by Tryon, and lubricated as formerly, from the central Bijur system.

Longer front springs (40 in. instead of 37 in. on the standard and custom 12). Springs of alloy steel and somewhat more flexible for better boulevard ride. Provided with Anderson metal spring covers as standard equipment. New Houdaille shock absorbers, double-acting.

Improved pressure plate in the Long clutch for smoother action, and requiring less pedal pressure to operate.

Most of the mechanical improvements in the twelve are duplicated in the eights.

On the eight there is a new Stromberg 1½-in. down-draft carburetor with new intake manifolding, incorporating also an automatic heat control. There are new Delco Products shock absorbers.

All eights carry the new needle-bearing universal joints. Air cleaners combined with silencers are on the Salon eight. There is a Floto oil intake, and a Purolator filter.

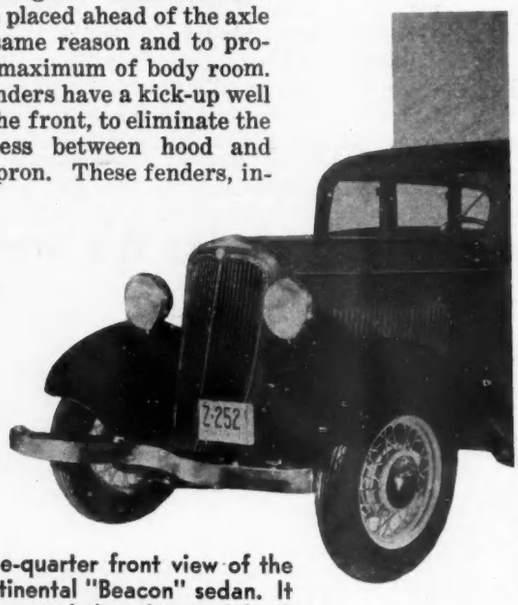
Mufflers are of the latest Oldberg three-tube type. Tires are 6.00/17 on the Salon eight with five-wheel, and 6.50/17-in. with six-wheel equipment.

Continental in Car Field with a Four

CONTINENTAL MOTOR CORPORATION'S subsidiary, Continental Automobile Company, the successor to the Continental DeVaux Company, is offering three lines of passenger cars for 1933, of which one, the C-400 "Beacon," is one of the lowest-priced lines on the market today. It is of ample body size for comfort, and light enough in weight to assure economy in operation. In addition to this car—a four with a wheelbase of 100½ in., and a standard tread of 56 in.—the company will produce the C-600 "Flyer," a six with a 107-in. wheelbase, having a chassis and body of almost identical design to the C-400, and also a larger six. The following description of the four applies also to the smaller six, except as regards the engine, axle bearings, pinion shaft, clutch and frame. The clutch of the six is larger, having a nominal diameter of 9 in.; the frame is of heavier stock, and the wheelbase, as already pointed out, is longer.

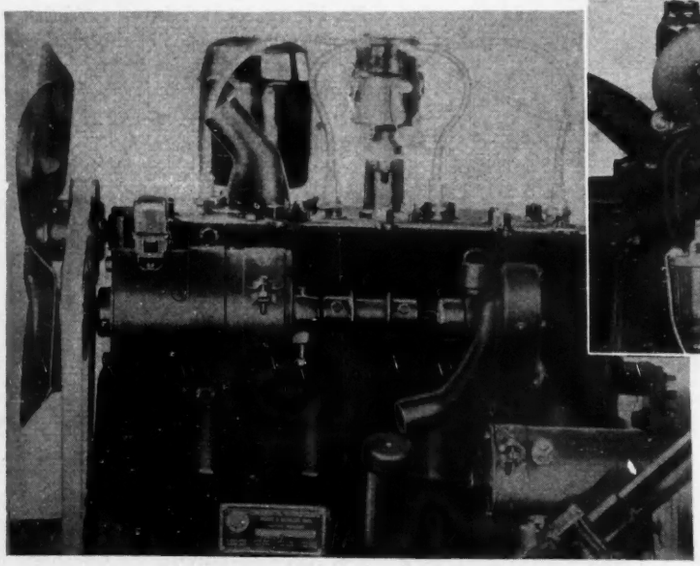
The shipping weight of the four is said to be slightly under 2000 lb.; the road weight of the sedan, approximately 2160 lb. Light weight—so desirable from the standpoint of economy—has been achieved mainly by the introduction of new design features, including an unconventional spring suspension, wide use of high-tensile alloy steels, and the use of a relatively small engine. The power-weight ratio, however, is close to 50 lb. per hp., which is near the average figure for all models on the market.

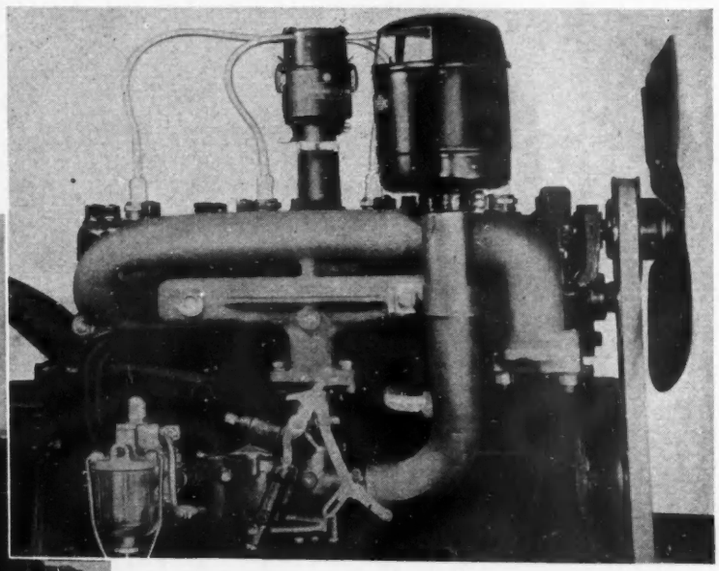
The car is strictly modern in appearance, with a beaver-tail back, a sloping V-shaped radiator, deep-drawn fenders concealing the chassis, a visorless, sloping windshield, etc. Hoods are made to overlap the cowl to the base of the windshield, to give an impression of greater length. Radiator and grille are placed ahead of the axle for the same reason and to provide the maximum of body room. Front fenders have a kick-up well toward the front, to eliminate the deep recess between hood and fender apron. These fenders, in-



Three-quarter front view of the Continental "Beacon" sedan. It is expected that this model will list at under $500.

Below is shown left-side view of the Continental C-400 engine, showing the accessories.

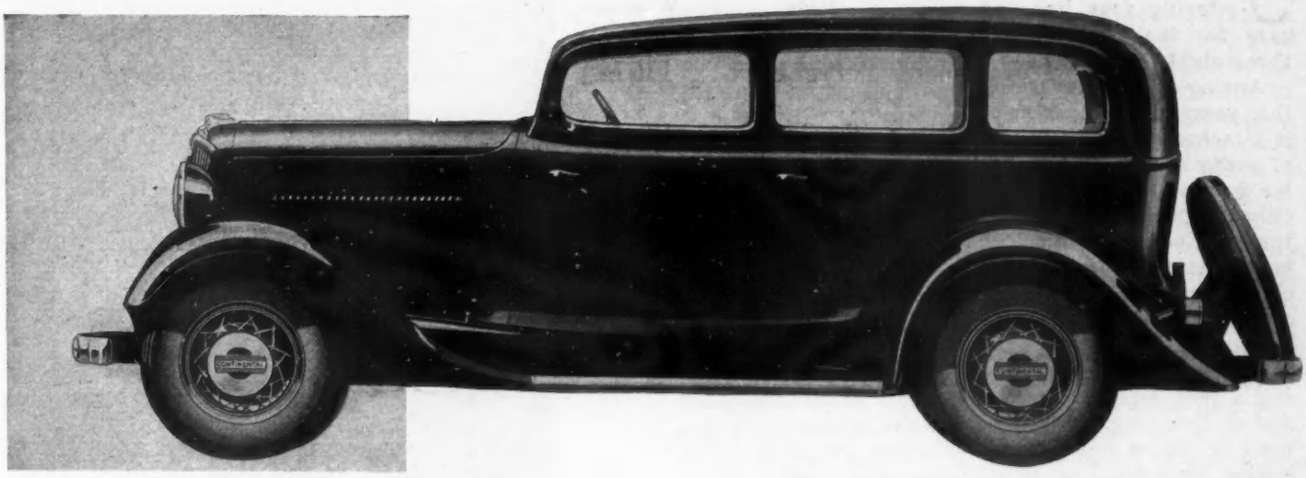




Above—Side view of the four-cylinder engine showing the manifolding and combination intake silencer and air-cleaner.

...r and Two Sixes in Low Price Bracket

by Athel F. Denham



New Continental five-passenger, four-door sedan with four-cylinder powerplant.

cidentally, provide a neat new touch in that they are shaped to fit around the front bumper bracket. Rear fenders, as well as front, have side skirts to conceal the chassis.

There is an ornament on top of the radiator shell, but the filler is located under the hood. An effective cowl ventilator is built into the lower windshield cross-bar, with the ventilator cover swinging forward to a horizontal position where it acts as an air scoop. There is a recess in the instrument panel for gloves, maps, etc.

Bodies are roomy, with 43 in. wide front, and 47 in. wide rear seat cushions, 19 in. deep. Front seats are adjustable to three positions. Upholstery is of Bedford cloth over helical tied cushion springs. A 10-in. opening between the front-door jamb and the seat cushion permits easy ingress and egress.

Gear-shift and brake levers are placed well forward, to give more room in the driver's compartment. Front-compartment features include a three-spoked steering wheel, large-dial, pointer-type instruments, including a fuel gage, all directly illuminated; a light switch on the dash, with foot-operated switch for beam control; a choke button which is connected also to the throttle, and a starter button in the center of the panel. Over the first part of its range of motion the choke button acts as a throttle, adjusting the idling speed; over the latter part of its motion it closes the choke valve. The windshield-wiper motor is located at the base of the windshield, rather than at the top.

Proceeding next to the mechanical design, the most unusual feature is found in the spring suspension. At the front there is a semi-elliptic transverse spring, which is fixed by a spring bolt at the left and shackled by means of a threaded U shackle at the right. This is the only spring shackle on the whole car, for the rear springs are double quarter elliptics anchored at the front to a tubular cross member of the frame, instead of to the side rails, and at the rear, to spring pads on the axle, one on top and one below the axle housing, the spring eyes being carried on threaded, lubricated bolts in bronze bushings.

Radius rods are used at the front, and connect to the frame side rails instead of to some part at the center of the chassis. The left radius rod is mounted con-

(Turn to page 21, please)

Continental Prices

Beacon:	
Roadster	$355
2-passenger coupe	380
2-door sedan	380
4-door sedan	395
Flyer:	
Roadster	450
2-passenger coupe	490
2-door sedan	510
4-door sedan	535
Ace rumble seat coupe	725
Standard 4-door sedan	745
Custom sedan	815

STUDEBAKER Offers Four Lines

Principal Characteristics and Price Range

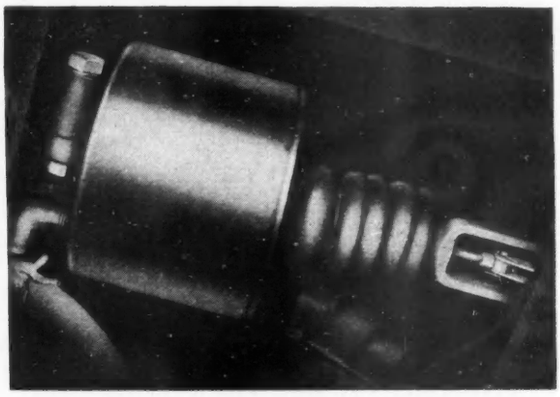
Model	Wheelbase	Displacement	Hp.	Price Range
Speedway President	135 in.	337 cu. in.	132	$1655-$2060
President	125 in.	250 cu. in.	110	1320 - 1635
Commander	117 in.	236 cu. in.	100	1025 - 1315
Six	117 in.	230 cu. in.	85	865 - 1145

STUDEBAKER Corp., South Bend, Ind., is offering four lines of cars for the 1933 season, three eights and a six.

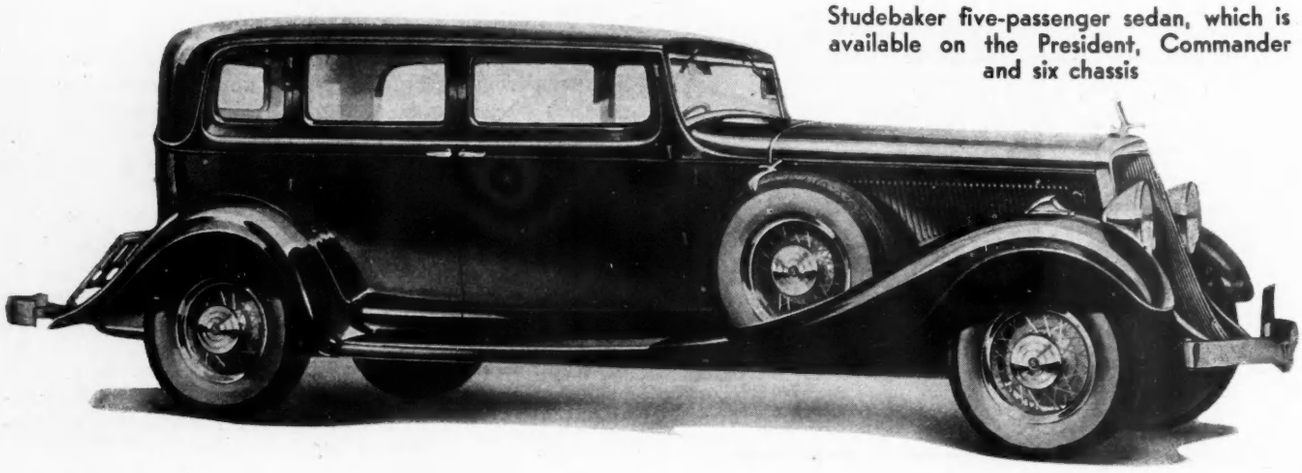
Among the innovations this year, most importance is attached to the provision of power brakes (B-K booster brakes) on all models. Other noteworthy new features include an automatic heat control, an automatic choke control, a new system of manifolding, and simplification of the task of chassis lubrication by eliminating a considerable number of points to be lubricated and so changing the design that the remaining points need attention only at much longer intervals. The bodies have been materially improved with respect to appearance, particular attention having been paid to the fronts and rears. Silencing of both the intake and the exhaust has been made more effective, and improvements have been made also in the steering gear.

There are twenty-two body types in the four lines. Two convertible bodies—a sedan and a roadster—are offered on each of the four chassis. In addition to these convertible bodies there are five-passenger sedans, St. Regis broughams, two- and four-passenger coupes, a seven-passenger sedan and a seven-passenger limousine on the long-wheelbase president. A State or Regal model of each body type is also provided on all chassis.

In the design of the new bodies, the endeavor has been to approach perfect streamlines more closely than in the past, and as a result, it is stated, the air resist-



The power cylinder of the B-K vacuum-booster brake which is standard equipment on all new Studebakers



Studebaker five-passenger sedan, which is available on the President, Commander and six chassis

s with Provision for Power Braking

Front end of the new Studebakers, showing the sloping radiator guard, curved forward at the bottom, with radiator aprons blending with the fenders

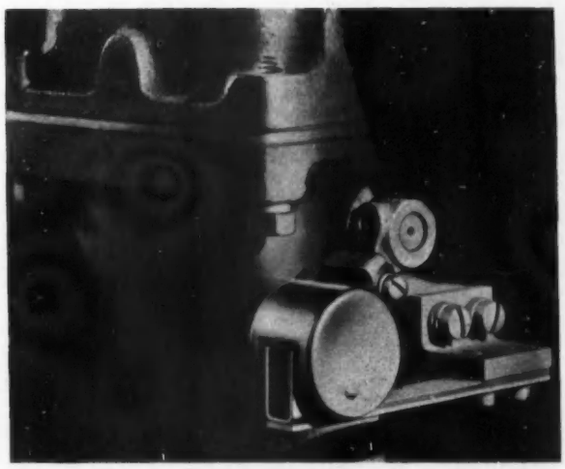
ance of the long-wheelbase President was cut down 8 per cent and its speed increased 4 per cent. The most important changes were made in the design of the front and rear ends and of the front fenders. Radiators slope at a sharper angle than in the past, and at the bottom they curve forward gently. Fenders blend into the radiator apron and are carried down low over the front wheels to cover the mechanism underneath the car. Running boards are curved slightly, to conform to the new body lines, and blend into the rear fenders. The rear deck, instead of being convex and curving up to meet the body, is concave and provided with lips which extend out and slightly down to conceal the rear springs and shackles.

Wheel diameters have been reduced from 18 to 17 in. A newly-developed spoked metal wheel is standard, while wire-spoked wheels remain optional. The fuel-tank filler now protrudes through the left rear fender, for greater accessibility. Ovaloid headlamps, fender lights, single-bar, center-dip bumpers, and chromium-plate finish are continued from last year.

Mention has been made already of the power brakes. These are improved Bendix mechanical, two-shoe, internal brakes with ¼-in. molded linings. Foot pressure on the brake pedal is assisted by a vacuum cylinder.

All of the engines are fitted with downdraft carburetors and downdraft manifolds, and all have automatic heat control. The latter feature is used in connection with an automatic choke. This combination relieves the driver of the necessity of hand control of the fuel mixture while starting and during the warming-up period. The automatic choke is controlled by a bimetallic thermostat located on the intake pipe. Heat control is entirely automatic and is effected by means of a valve in the exhaust pipe which is ordinarily closed by means of an unbalanced weight. A latch, ordinarily held in the closed position by a thermostatic spring, holds the valve closed until the engine has attained its working temperature. When this valve is closed, all of the exhaust gases from the engine are passed through the jacket on the intake manifold, which results in raising the intake manifold to the normal working temperature in a short time. The thermostatically controlled heat valve then begins to open and to reduce the proportion of the exhaust gases passing through the intake jacket. At wide-open throttle very little exhaust passes through the jacket. The principal difference in comparison with former practice is that whereas formerly the heat was either all on or all off, now the supply of heat to the intake gases is regulated in accordance with requirements. During the warming-up period, in the same measure as the supply of heat to the inlet manifold is cut down, the richness of the mixture is reduced by the automatic choke.

All engines are mounted on rubber, which, together



Automatic heat control which acts on a valve in the exhaust manifold, varying the flow of the exhaust gases in accordance with the temperature under the hood

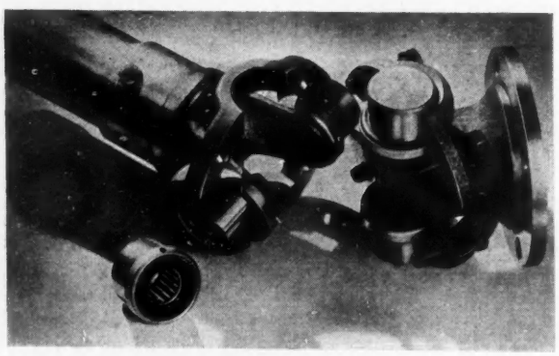
with the improved muffling of the intake and the exhaust, and with preselective free wheeling and synchronized gear shifting, is said to render the new Studbakers smoother and quieter.

From the servicing standpoint the reduction in the number of points on the chassis that require attention for lubrication is of importance. There are now only four points which require lubrication after 2500 miles, the remaining points requiring attention only after 5000 miles. This result has been achieved by eliminating a large number of points which formerly required lubrication and by so changing the design of other points that lubrication is required by them only at much longer intervals. The steering drag links on all models are provided with wick-type magazine oilers, which need attention only every 10,000 miles.

Ball-bearing spring shackles, flexible metal spring covers, and ride control, features that make for improvement in riding qualities, have been extended this year to all lines. The form of ride control employed is said to automatically adjust the resistance of the shock absorbers for variations in speed, temperature and road conditions. All models are equipped with a kick-shackle on the left front spring. Three-spoke, steel-core steering wheels are used all around.

Upholstery is in broadcloth or mohair in the closed models and in leather in the convertible types. Except in the convertible sedans, the front seats are adjustable. All closed bodies have heavily padded arm rests for the rear seats; a number of them, silken assist cords and hassocks. All interior hardware is finished in bright nickel. All closed models are wired for radio.

De Luxe models have six chromium-plated steel-spoked wheels, a trunk rack and an ornamental radiator cap. Sedans and broughams having this equipment are also provided with a trunk on the rear and a center folding arm rest for the rear seat. All instruments are of the dial type. The equipment includes a remote-reading thermometer and an electric gasoline gage, which latter is provided with a small button to permit making readings when the ignition current is turned off. Other interior fittings include an adjustable sun visor, automatic windshield wipers, a rear-vision mirror, a clock and (in President models) a pass-around cigar lighter, while all sedan models and St. Regis broughams in addition have dual ash receivers.



One of the parts that calls for less frequent lubrication on the new Studebakers is the universal joint, which is here shown disassembled

Compression ratios on all engines have been increased to 5.5, and the form of the combustion chamber has been slightly changed to favor a high compression ratio. Cylinder dimensions are 3½ by 4⅜ in., 3 1/16 by 4¼ in., 3 1/16 by 4 in., and 3¼ by 4⅝ in. for the four chassis respectively. Bohnalite invar-strut-type pistons with slit skirts are used in the President models and electroplated cast iron pistons in the Commander Eight and the Studebaker Six engines. Crankshafts in the eight-cylinder engines are supported in nine steel-backed, babbitt-lined bearings each, while in the six-cylinder engine there are four main bearings. Filters for oil, fuel and air are standard equipment on all four lines. Camshafts are supported in six steel-backed, babbit-faced bearings in the eight, and in four in the six-cylinder engines. Camshaft drive is by composition gears. Intake valves are of chrome-nickel steel and exhaust valves of silicon-chromium steel. Connecting rods are drilled with bleeder holes in their heads for squirt lubrication of the cylinder walls.

Carburetion on all eights is by a new Stromberg downdraft duplex 1¼-in. carburetor, while the new Six has a single carburetor of the same size and type. Downdraft manifolds are used throughout, in conjunction with full kinetic automatic spark control. The ignition units are of Delco-Remy design; they have a cap specially designed to render them waterproof. Fuel feed is by pump. Tank capacities are as follows in the different models: 20, 17, 14 and 14 gallons.

On the eight-cylinder engines the water pump is driven through a coupling from the generator shaft, while in the six it is driven by the fan belt. Cooling-water temperatures are controlled by a thermostatic valve in the cylinder head.

Clutch Is of Single Disk Type

The clutch on all models is a single-disk type with spring-type torsional damper. The transmission is an improved three-speed type with helical gears, synchronized shift, and free-wheeling unit, which latter can be locked at will by means of a lever on the instrument panel below the steering wheel. A dial on the dash registers either "Free wheeling" or "Conventional."

The rear axles are of the semi-floating type, with shafts of chrome-molybdenum steel. Timken bearings are used at the pinion, differential and wheel hubs. The pinion is adjustable from the outside. The standard rear axle ratios are 4.31, 4.73, 4.36 and 4.36 in the four models, respectively, but other ratios are available. The Hotchkiss drive is employed and propeller shafts are of electrically-welded tubing.

Spring dimensions on the different models are as follows:

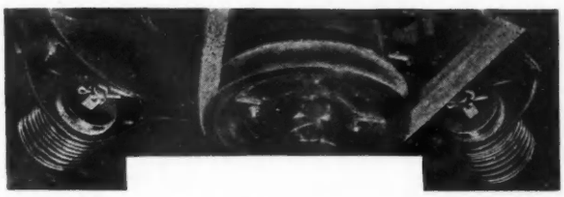
	Front	Rear
Long-wheelbase President	38 by 2 in.	60 by 2½ in.
Short-wheelbase President	36 by 2 in.	54 by 2 in.
Commander and Six	36 by 1¾ in.	54 by 1¾ in.

The steering gear is of the Ross cam-and-lever type, with 20 to 1, 17 to 1, 15 to 1 and 15 to 1 ratios on the four chassis respectively. On the Presidents the steering-gear lever pin is roller-mounted.

Balloon tires are standard equipment on all models, the sizes fitted being as follows: Longer President, 7.00/17; shorter President, 6.50/17; Commander, 6.00/17; Studebaker Six, 5.50/17. A six-ply tire is used on the larger President.

Continental in the Low Price Field With a Four and Two Sixes

(Continued from page 17)



Front view of chassis showing the transverse front spring and the shock absorber installation.

centric with the rear end of the drag link, which is said to eliminate wheel fight. Tie rods have ball connectors. A Gemmer worm-and-sector steering gear is fitted. Steering knuckles have the spindles and steering arms forged integral with them. Single-acting shock absorbers are standard equipment.

The springs, it will be noted, afford what amounts to a three-point support for the chassis. Frames have three cross members in addition to the tubular one already mentioned, including a Z member at the front, a box-section member at the transmission, and a wide member supporting the tire carrier and the fuel tank at the rear. The side rails are 17½ in. from the ground, and have panels embossed on them for increased strength. Reinforcing plates are located at the steering-gear and rear central cross-member supports and at the shock-absorber and front-fender brackets.

Rear axles are semi-floating, with housings split on the right side, shim-adjusted, with Timken roller bearings at the wheels, and similar bearings at the differential and from the pinion shaft. Oil is fed by the ring gear into a duct, to maintain an oil-level up to the center of the forward pinion bearings. The gear ratio is 4.33 to one. Axle shafts are of molybdenum steel, with an elastic limit in excess of 170,000 lb., it is claimed. They are of 1¼ in. diameter at the wheel bearings.

The 2-in. tubular propeller shaft carries needle-bearing universal joints, the slip joint for the forward universal being located within the transmission case and lubricated from that case.

Transmissions are of the silent-second type, using helical gears, of the sliding type, riding on helical splines on the main shaft, of the same helix angle as that of the gears. Countershaft-drive gears are constant-mesh, of course. Direct drive is engaged through the usual dog clutch on the sliding gear on the mainshaft. Mainshaft mounting is on ball bearings, with a Hyatt roller pilot well forward, and bronze bushings for the countershaft.

Clutches are of the Rockford single-plate type, 8 in. in diameter on the four, 9 in. on the six.

The four-cylinder 143.1 cu. in. engine, of nearly square cylinder dimensions, is mounted on the chassis by means of modified Borg-Warner mountings, which provide a cushioning effect under both torque and inertia forces. There are three mountings, the one at the rear of the transmission being of circular-arc form, to permit a rocking motion of the powerplant. With the same object in view, the front mountings are placed at an angle and consist of springs between the engine flange and the front cross member, enclosing a rubber core. Rubber insulating disks are placed between the engine bracket and the cross-member flange, to eliminate metal-to-metal contact.

Engine design follows Continental Red Seal practice. Cylinders are completely water-jacketed, as are the valve seats. Intake manifolds are of the two-port type, but divided internally to give the equivalent of a four-port manifold. Carburetors are updraft, but the air intake through the combination silencer and air cleaner is located above the block.

The engine in the C-600 "Flyer" is also of new design, though, like the four, it follows former Continental engine practice. It has cylinder dimensions of 3 by 4 in. and is claimed to develop 65 hp. at 3500 r.p.m., for a displacement of 169.6 cu. in. The engine mounting in this car is similar to that in the C-400.

No attempt was made in the design of the C-400 to obtain outstanding performance characteristics, and economy is the chief sales point; a top speed of 60-65 m.p.h. is all that is claimed. Continental engineers state that tests have shown that the car will average 33 miles to the gallon of gasoline, at 40 m.p.h.

The Continental Big Six, the third car in the line, is understood to be a development of last year's Continental DeVaux, incorporating the new engine mountings, but having a conventional spring suspension and chassis.

Bodies of the four and light-six lines are of all-steel construction, with a steel underbody having a steel pan ribbed for strength and to prevent drumming. Sills are also of steel. Roofs are of composite construction, with cross slats and French-type steel side panels. Headlight-brackets are mounted in rubber and bolted through the chassis side rail and the front cross member.

New Plymouth Rear Axles Have Welded-on Covers

THE rear axles of the new Plymouth cars are of an entirely new design, one of the features of which is that the cover on the rear of the center housing is welded in place and therefore is not removable.

This construction makes it possible to increase the strength and rigidity of the axle housing without increasing its weight. The differential and driving gear together with their bearings are removable through the opening on the forward side of the housing, after the axle shafts have first been removed.

Longer De Soto Offers Easier Starting

OFFERED in two lines of bodies, standard and custom, the new, more powerful De Soto Six, on a longer (114-in.) wheelbase, shows also a variety of mechanical improvements and additions, not the least important among which are a coincidental starter which obviates the need for a separate starter pedal or button, and an automatic choke. These two items together greatly simplify the starting operation, especially in cold weather.

The car also has a new transmission, which is silent in all speeds, including reverse, by virtue of the use of helical gears throughout. Low-speed and reverse gears are engaged by sliding the main-shaft gear into engagement on helical splines.

Floating power remains an important mechanical feature, of course. Rear axles are new, and have the rear cover plate welded on. In general design the axle is similar to that of the 1933 Plymouth recently described in these columns, except for size.

Some of the more important developments in the new line are as follows: Threaded U-type shackles at the rear end of all springs, with rubber mounting of spring at the forward end oilite inserts in spring eyes to eliminate squeaks and rattles; an independent mounting for the radiator and front fenders to steady

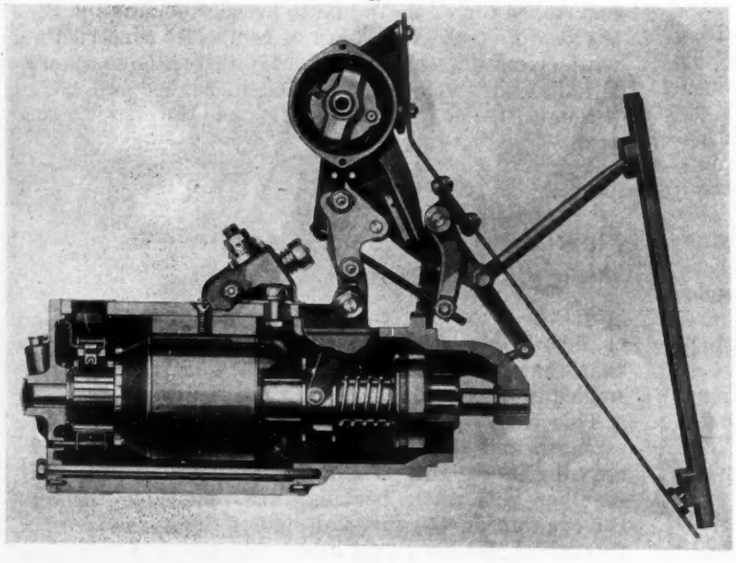
The Prices Are—

Business Coupe—$695
Rumble Seat Coupe—$735
Brougham—$695
Four Door Sedan—$765—Down ten
Special Brougham—$725
Custom Line Coupe—$790
Five Passenger Sedan—$835
Convertible Coupe—$845
Convertible Sedan—$975

Mechanical Data

Unless listed here all specifications remain as formerly:

Wheelbase	114 in.
Engine stroke	4⅜ in.
Displacement	217.8 cu. in.
Max. power	79 at 3400 r.p.m.
Carbureter size	1½ in.
Intake silencer	yes
Choke control	automatic
Idle speed control	thermostatic
Manifold heat control	automatic
Valve seat inserts?	yes
Exh. guide clearance	.002-.004 in.
Battery capacity	90 amp. hours
No. of plates	15
Starter engagement	coincidental mech. shift
Flywheel teeth	146
Starter ratio	16.22 to one
Spark plug gap	.025 in.
Frame depth	5 in.
Fuel tank capacity	15½ gals.
Oil filter	yes
Muffler, diam.	6 in.
Length	23 in.
Steering	worm and wheel
Ratio	15 to one
Worm thrust bearing	double Timken
Steer. wheel diam.	18 in.
Adjust. column?	yes
Rear-axle ratio	4.375
Ring-gear teeth	35
Brake drums	centrifuse
Total brake area	113.5 sq. in.
Clutch diam.	
Outside, facings	9⅞
Inside	6¾
Cooling capacity	4 gals.
Fan diam.	17 in.
Fan-blade setting	50 deg. and 130 deg.
Rad. core thickness	3¼ in.
Standard tires, std. line	5.50/17
Custom line	7.00/15
Wheels, std.	wood
Optional	wire
Tread, front	57 13/16
Rear	59¼



Linkage and cut-away of the coincidental starter mechanism, accelerator pedal operated, on the 1933 De Soto models

with Improved Device, Choke

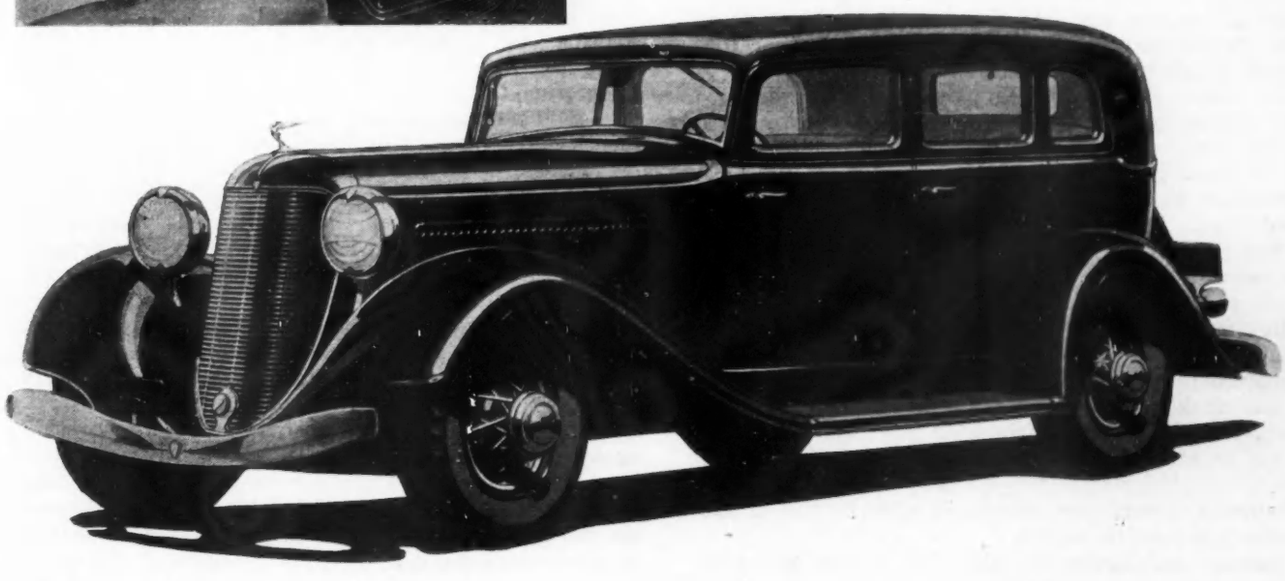
the front end of the car body and prevent transmission of frame distortion to these units; a larger fuel tank; needle-bearing universal joints; an extension of the forward arms of the frame X member to the front cross-member for additional frame stiffness; a heat deflector for the fuel pump as additional safeguard against vapor lock; downdraft carburetion; a new AC air cleaner and intake silencer; addition of a pendulum-type valve to the automatic clutch mechanism to cushion the clutch engagement and prevent car surge; adoption of 7.00-in. air wheel tires on 15-in. wheels on the custom models; an automatic heat control for the inlet system, and needle bearings on the driving shaft in the steering gear.

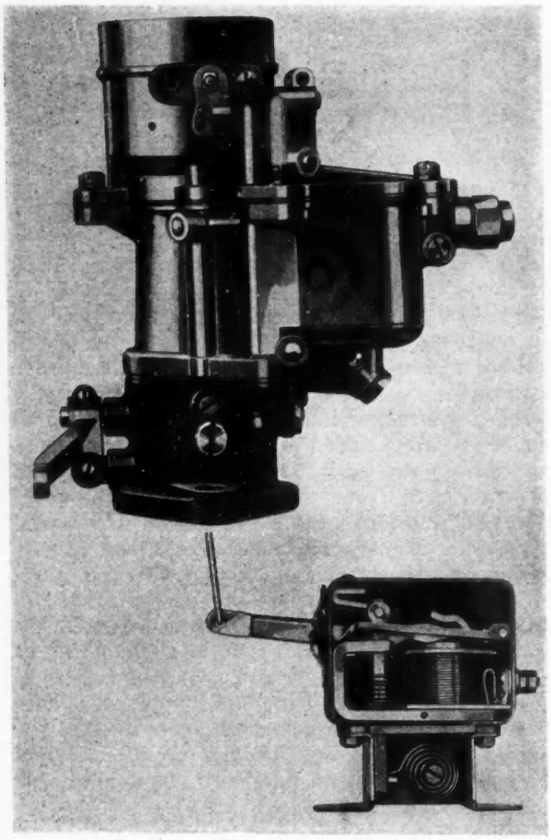
Taking a look at the interiors of the new cars, we find ash trays built into the door and rear compartment window molding—ash trays having little cups in which cigarettes can be extinguished; there are really comfortable form-fitting bucket seats in the two-door sedan models; safety glass is standard in the windshield; ash trays are also found on door moldings of coupes and on both front door moldings of the four-door sedan; there are coat hangers integral with assist loop brackets in the sedans; instruments are attractively grouped in the center of the panel, with a glove compartment to the right; there are two interior sun visors instead of the single one used last year; steering columns are adjustable; instruments include a gas gage, an engine thermometer, and a large-face speedometer, with the actual markings all on the glass covering the center panel. The instruments themselves have no marking and are all of the pointer type. Steering wheels are grained and finished to match the interior moldings and instrument board.

In addition to these features, the deluxe or custom line has all interior trim finished in two tones, and has all control knobs finished to match. Trim in these cars is of the paneled type. In the custom line rear window curtains can be raised and lowered by the driver through a control located in the head lining over the left front door. There are oval vanity mirrors in the front-door pillars, bolster-type arm rests in the rear of sedans, and assist loops fastened to the side wall by

Front interior compartment showing the new instrument panel and steering wheels, etc., finished to match interior garnish molding and instrument panels, etc.

De Soto standard Sedan.





Detail of the automatic choke used on the 1933 De Soto six

snap-buttons to prevent their swinging when not in use. Standard equipment on the custom line includes a cigar lighter, two windshield wipers, two chrome-plated horns and two tail lights. Sheet metal work is finished to match the body colors.

The outside appearance of these cars is not very different from that of the 1932 models, although lines have been improved by increasing the slope of the radiator front, by making fenders and front splashers integral, and by adopting a new form of bumper that curves up at the ends and is low in the middle. This type of bumper also has the practical advantage in that its height range is greater and it will therefore match in height the bumpers on a greater number of other cars. A ventilator is now located in the cowl centrally on top, and this part of the cowl is not covered by the hood. A De Soto medallion placed at the center of the headlight lense is said to possess the practical advantage that it reduces the glaring effect of the headlamps. There is also an intermediate headlight switch position for country passing, in which position the beam to the left of the road is depressed, while that to the right is raised for illumination well ahead.

Returning once more to the mechanical features, mention should be made first of the increased performance resulting from an increase of ⅛ in. in the piston stroke. In line with the increase in displacement, the size of the carburetor has been increased to 1½ in. and the radiator core thickened. Fans have been silenced by staggering the blade angles. Inserted exhaust-valve seats are now used, and the size of the muffler has been increased.

Clutches are larger, to take care of the increased engine power; the rear-axle ratio has been decreased for higher car speed relative to engine r.p.m. Centrifuse drums were adopted during 1932 and are continued. The tread has been increased ¼ in. at the front and 2 in. at the rear, for increased body room. Batteries are larger. A kick shackle is found on the left front spring.

Steering gears are of the same new type as used on the Dodge 6, incorporating a needle-bearing mounting for the worm roller.

The steering ratio has been increased for easier steering, and the entire steering layout has been worked out so that either standard balloon or airwheel tires can be used. Standard tires are larger in section, also. Wood wheels are now standard equipment, with wire wheels optional.

The coincidental starter on the new De Soto is a highly ingenious device. It consists essentially of a selector unit with three arms extending from the selector housing. One of these levers connects to the accelerator pedal, another to the throttle cross-shaft, and the third (in the shape of a pedal) actuates the starter shift mechanism and starter switch. The selector proper consists of a two-way clutch actuated in one direction by a spring, and in the other by a diaphragm controlled by intake-manifold vacuum.

When the engine is not running and the accelerator pedal is all the way back, the clutch is in such a position that the accelerator pedal lever engages the pedal which actuates the starter-shift mechanism. The first movement of the accelerator does not move the throttle cross-shaft. This lever is picked up at such a point that the throttle will be one third open when the accelerator has been depressed to the position where the starter pinion is fully engaged, and the starter switch closed.

The mechanism is then in the cranking position. As soon as the engine is running, manifold vacuum acting on the diaphragm, tends to disengage the starting motor. Release of the accelerator pedal, however, is necessary to permit this disengagement due to friction in the mechanism. When this is done, the accelerator controls the throttle only.

Stopping Engine Releases the Selector Clutch

When the engine is running, the accelerator pedal will not come all the way back to its original (standstill) position, as the two-way clutch in the selector ties it to the throttle cross-shaft, permitting return motion only up to the idle position. Stopping the engine releases the selector clutch, so that the pedal can return to its original position, for repetition of the cycle. This arrangement, through an interlock, prevents re-engagement of the starter switch mechanism as long as the engine is running.

Incidentally, when the engine dies the accelerator will come farther back than while it is running, to permit hooking up of the starter linkage. Normally the accelerator will return only to the correct idle position of throttle opening.

The automatic choke, produced by Pierce Governor, fits in admirably with this arrangement. It is thermostatically controlled, and regulates the choke position according to the temperature of the intake manifold. There are two other thermostats in the carburetion system, one for the automatic heat control, and one located between the stop screw on the carburetor idle adjustment, and its stop. This latter serves to assure an increased minimum throttle opening during the warm-up period.

Standard Reo-Royale sedan

Reo Body Refinements

for 1933 increase the appearance of length. Fender skirts add to pleasing lines

TWO years ago, the introduction of the Reo Royale started a new trend in automobile body design which has been widely followed since. From this it follows that as regards body design at least, Reo has had a certain lead which obviated the need for extensive changes to modernize its product for 1933. However, a number of refinements have been made in both the chassis and the bodies of the two Reo lines for 1933, and certain new equipment has been adopted.

Three major appearance changes are to be noted. There are fender skirts to more effectively conceal the chassis, and protect the bodies against road splash from the wheels; radiators have been given a good deal more slope toward the front, and have been moved forward as a result, increasing the appearance of length.

In addition to changes in hardware and interior trim, there are new instrument panels on both the Flying Cloud six-cylinder line, and the Royale eights on their 130 and 135 in. wheelbases.

New X-member frames have been adopted. Forward legs of the X-member extend in the side rail, forming a box section therewith, to the front, where they are curved inward to form a K-member with the front cross-member. On the arms of the K-member rest the front supports of the air-cushioned new rubber mounting. These are supplemented at the rear by two more engine mountings at the transmission, fairly close together.

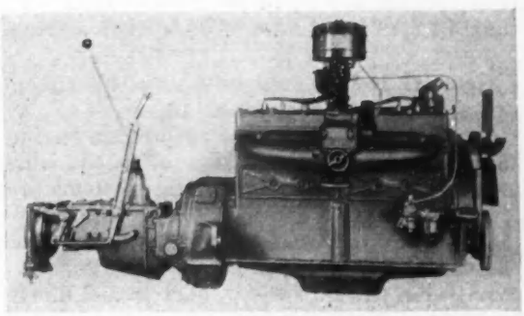
These mountings are designed mainly to take the weight of the powerplant. On the Flying Cloud model the torque reaction on the engine is resisted by what was formerly one of the rear supporting brackets, which extends out to the frame side rail and is there mounted in rubber, virtually forming a torque arm. On the Royale both rear engine mounting brackets are carried in rubber on the side rails.

On the Flying Cloud there is a new Stromberg downdraft carburetor, and standard equipment on both models now includes a thermostatic choke, thermostatic water circulation control, and thermostatic idle adjustment (by virtue of the choke linkage). A thermostatic heat control is also standard equipment.

During the 1932 season the bore of the Flying Cloud engine was increased to 3⅜ in. No official announcement has been made of this change up to this time, though the specifications have shown it.

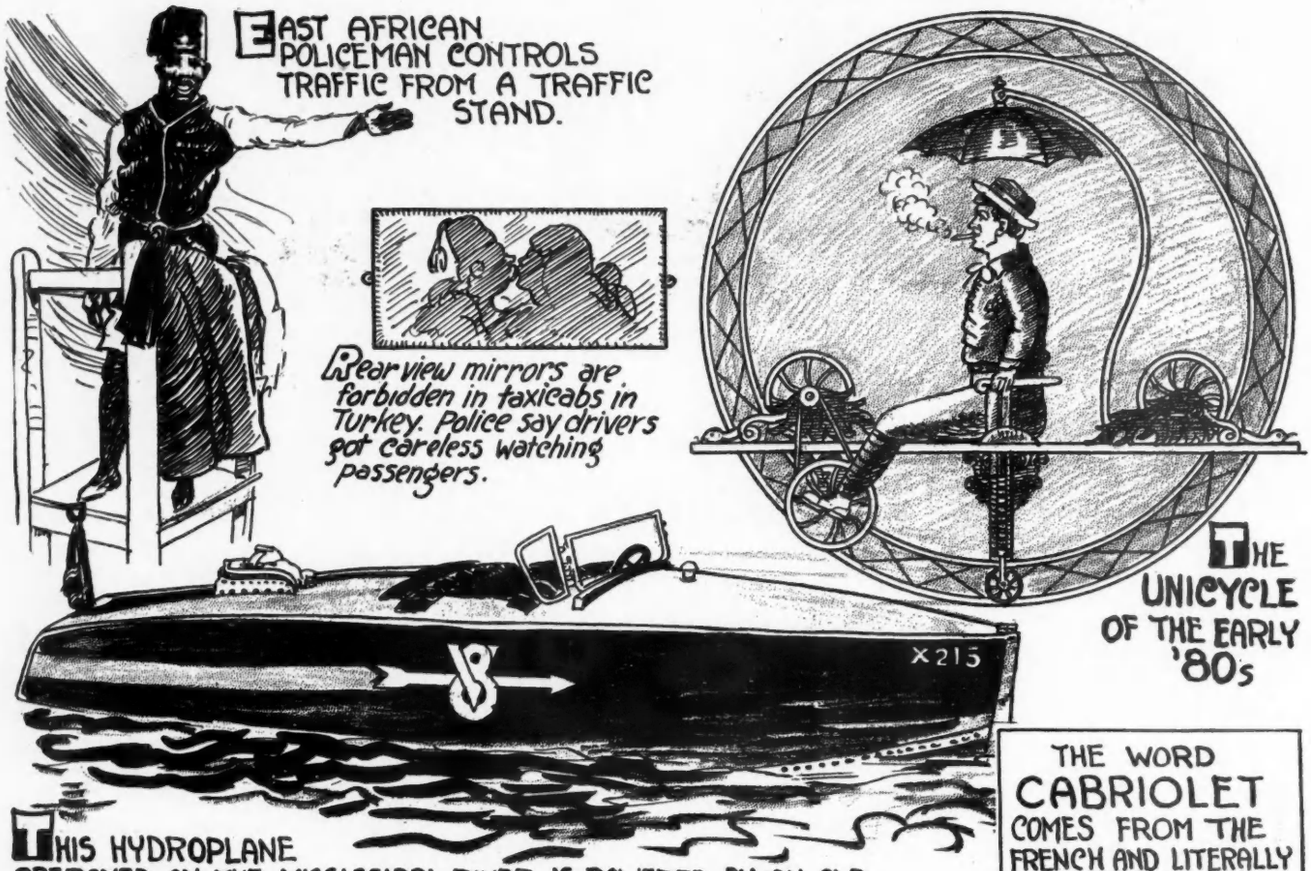
Spring-type anti-kick shackles have been adopted for both lines. They are located at the front end of the left front spring on the Flying Cloud, and at the rear end of the Royale models. On the Flying Cloud threaded U-type shackles are now used.

The base price on the Flying Cloud line it has been learned will be $995.



Reo Flying Cloud engine

Automotive Oddities—By Pete Keenan


EAST AFRICAN POLICEMAN CONTROLS TRAFFIC FROM A TRAFFIC STAND.
Rear view mirrors are forbidden in taxicabs in Turkey. Police say drivers get careless watching passengers.
THE UNICYCLE OF THE EARLY '80s
X215
THIS HYDROPLANE OPERATED ON THE MISSISSIPPI RIVER IS POWERED BY AN OLD AUTOMOBILE ENGINE CONVERTED AFTER 85,000 MILES OF SERVICE.
THE WORD CABRIOLET COMES FROM THE FRENCH AND LITERALLY MEANS "GOATS LEAP"

Write us if you know an Oddity

The News Trailer

Five thousand surplus car frames, now obsolete, built by A. O. Smith Corp. for an unidentified Detroit manufacturer, were shipped as scrap to Detroit.

Despite better highways and improved quality of tires, production of Shaler "hot patches" is reaching the all-time record total of 30,000,000 a year.

General Motors is conducting experiments to improve below zero motoring.

Tests in a cold room are keeping an engine at about 38 deg. below. Elimination of rapid condensation, moisture freezing and other ice problems are studied.

Do-see-do and grand right-and-left! Swing your partner, and promenade home!

With the tinkle of the cymbalum and dulcimer ringing out the gentle rhythms, Henry Ford and Mrs. Ford led about 200 guests through the subtle paces of the five-step schottische and the varsouvienne recently at the first of their old-fashioned dances this season.

It was the first time Mr. Ford has been at a large gathering since he went under the surgeon's knife at Henry Ford Hospital about a month ago.

Berlin must repave its slippery streets, because a court held that the city is liable for damages to skidding automobiles. Practically all streets of the city, or 70 million sq. ft., are of oil-soaked asphalt and extremely slippery in wet weather.

For the thirteenth time the Quebec Provincial Motor League will request the Quebec Legislative Assembly to compel all vehicles using the highways in Quebec after sundown to carry tail-lights.

A total of 115,000 acres in Russia was sown this year by airplane, 62 per cent of this acreage being sown to wheat and rye,

NEWS

Sen. Harrison to Give Budget Ideas at Dinner

Vigorous Speaker Will Headline Annual N.A.C.C. Event Jan. 10; Others Add to Brilliant Program

NEW YORK, Jan. 5—Senator Pat Harrison will be the principal speaker at the Annual Show Dinner of the National Automobile Chamber of Commerce at the Commodore in New York City, Tuesday, Jan. 10. As the next chairman of the Senate Finance Committee, he is in the best position to know what must be done to balance the budget.

The other speakers will be Floyd W. Parsons, well known engineer, editor and journalist, who will speak on "Technocrats and Tomorrow," with Julius Tannen to furnish the humor.

Indications are that this year's dinner will be the largest ever held. This is typical of the spirit of the industry to carry on with unabated vigor.

Gathered at the Commodore on that evening will be not only the leaders of the motor industry, but presidents of many companies in other industries and notable figures in the fields of transportation, communication, finance, publishing and government.

Among those who have been invited to sit at the head table with the National Automobile Chamber of Commerce directors are:

J. E. Williamson, president, New York Central; M. H. Aylesworth, president, National Broadcasting Co.; Hon. Roy D. Chapin, U. S. Secretary of Commerce; Adolph Ochs, publisher, New York Times; R. O. Lord, president, Guardian Detroit Union Group; Hon. Charles A. Harnett, commissioner of motor vehicles, N. Y.; Thomas H. MacDonald, chief, U. S. Bureau of Roads; L. O. Head, president, Railway Express Agency; Newcomb Carlton, president, Western Union Telegraph Co.; Pierre S. duPont, chairman, E. I. duPont De Nemours & Co.; C. M. Chester, Jr., president, General Foods Corp.; Col. Sosthenes Behn, chairman, International Telephone & Telegraph Co.; Gerard Swope, president, General Electric Co.; Gen. James G. Harbord, chairman, Radio Corp.; John A. Hartford, president, Great Atlantic & Pacific Tea Co.; Will H. Hays, president, Motion Picture Producers & Distributors of America; R. W. Woodruff, president, Coca Cola Co.; Gar Wood, Bernard M. Baruch, National Transportation Committee; Hubert H. Parsons, president, F. W. Woolworth Co.

There will also be the presidents of trade associations in the automotive and kindred lines.

Hupp, Graham, Pontiac To Swell Payrolls

Body Makers to Recall Thousand in Next Couple Months —Some on 7-Day Week

DETROIT, Jan. 6—A further increase in production and employment of motor and accessory companies is indicated for the coming week.

Hupp Motor Car Corp. now has 1,500 on its payroll. Shipment to dealers were begun this week.

Several hundred men were added to the working forces of Graham-Paige Motor Corp., when it starts production of its new line bringing total employment at its plants to 1,500.

A substantial increase in employment has been made by Oakland Motor Car Co., which is now in production of the new line of Pontiac cars, with current employment around 2,000.

Announcements have been made recently by other companies already under way with their production programs, of the recalling of several thousand men.

Body companies shortly will begin recalling additional workers. Murray Corp. of America, with 3,200 now at work, expects to add several thousand in the course of the winter months. Briggs Mfg. will add more than 4,000 men in the next couple of months.

Motor Products Corp. has been gradually increasing its payroll for the past month.

Pontiac Eights Priced Below 1932 Six Line

DETROIT, Jan. 3—The 1933 Pontiac is offered at factory list prices which on several models are below the factory price of the 1932 Pontiac Six. Comparative prices, f.o.b. factory, are as follows:

Model	*1933 Straight 8*	*1932 Six*	*Difference*
Roadster	$585	no model	—
*2-D. Sedan	635	$645	$10
Stand. Coupe	635	635	None
Sport Coupe	670	715	45
Tour. Sedan	675	no model	—
4-D. Sedan	695	725	30
Conv. Coupe	695	765	70

The 1933 Pontiac line was described in *Automotive Industries*, Dec. 24-31 issues.

Facts

The Fifteenth Annual Statistical Issue of *Automotive Industries* will appear January 25.

This valuable reference work will include statistical tables showing registrations, sales and production of U. S. and foreign cars and trucks, buses and aircraft, giving comparable data from the earliest years of the industry.

Data on production of vehicles by open and closed body styles, by retail price classes, percentages of passenger car production and data on production of parts are some of the important types of material which will be shown in this issue.

Detailed mechanical specifications of American and foreign cars, buses, trucks and aircraft engines and a greatly augmented table of U. S. and foreign high speed Diesel engine specification will give engineers basic information on this increasingly important type of powerplant.

Specifications on gearsets, rear axles, steering gears, front axles and clutches will further add to the value of the issue.

Willys Makes Bid For Low-Priced Lead

Triple or Quadruple 1932 Sales is Goal: 6000 on roll Now, Willys Says

TOLEDO, Jan. 3—John N. Willys today said he expects Willys-Overland to triple or quadruple the company's 1932 sales volume in 1933. The company is out for leadership in the low-priced field, he said.

He announced there are now 6000 on payroll at the plant here and that orders for immediate delivery had necessitated speeding schedule.

Shipments to dealers have begun and effort is being made to get samples out before public announcement of the cars at the New York Show.

He said Willys-Overland is beginning 1933 with a clean slate with field stocks of previous models cleaned up in good shape.

"The new 1933 car may be bought for as low as $5 a week and will operate 25 to 30 miles on a gallon of gasoline," he said.

Reo Reduces Capital

DETROIT, Dec. 30—At a special meeting of stockholders of Reo Motor Car Co., Tuesday, it was voted to reduce the authorized capital stock to $10,000,000 from $20,000,000, changing the par value to $5 from $10.

Canadian Production Is Down in November

25% Drop for Month, Although Gain is Shown Over September, 1932

OTTAWA, Jan. 3 — Production of automobiles in Canada at 2204 cars in November was 25 per cent less than the 2923 cars made in the previous month which in turn was 25 per cent greater than 2342 cars of September.

The decline from October was general to all types of cars, passenger cars dropping to 1669 from 2361 and trucks to 535 from 562, according to government figures just released.

Of the November output only 484 cars were made for sale in this country, the balance of 1720 being for export.

The number of cars manufactured for use in Canada in November was the lowest for any month during the year to date, while the number made for export was exceeded only during July and October.

The apparent consumption of cars in Canada during November, as determined by adding the 484 cars made for sale in Canada to the 40 imported, amounted to 524 cars.

During October, 1932, the apparent consumption, thus computed, was 740 cars in November, 1931, it totaled 970 cars.

Chrysler Export Head Hits Skittish Exchange

DETROIT, Jan. 2—"Stabilization of exchange is one of the vital factors that will revive export trade, and the proposed World Economic Conference offers strong hope in this direction," said E. C. Morse, president of Chrysler Export Corp., recently on his return to Detroit from a world tour of business study.

"There is a growing world interest in the United States and what we are going to do toward economic readjustment," Mr. Morse added.

"Automobile exports will be restricted until there is a currency stabilization."

As for the tariff, Mr. Morse declared that there must be reciprocal agreements.

French May Build Car in Canada

TORONTO, Jan. 3 — Arrangements are under way for the manufacture of a French light automobile for the Canadian market in the plant of Dominion Motors, Ltd., Toronto.

The latter already produces the Frontenac, Durant and Rugby line of cars and trucks for itself and Reo cars and trucks under contract of manufacture for the Canadian and export markets.

Orr is Willys Vice-President

G. V. Orr

G. V. Orr has been elected vice-president of the Willys-Overland Co. He has been with Willys-Overland for 19 years. For the past three years he has been vice-president of the Willys-Overland Pacific Co. in charge of sales on the West Coast.

In his new executive capacity he will make his permanent headquarters at the company's main offices in Toledo. He is succeeded on the Pacific Coast by Norman DeVaux, whose appointment was recently announced by John N. Willys, chairman of the board.

Invents Accelerometer And Grade Indicator

SCHENECTADY, N. Y., Jan. 3—W. B. Potter of the General Electric Co. has devised a small meter which serves both as an accelerometer and as a grade indicator. It comprises a glass tube bent to the shape of a rectangle and partly filled with mercury. This is mounted on a flat base so that the meter may rest on a window sill parallel to the vehicle's direction of travel.

The glass column toward the rear of the vehicle is marked off in miles per hour per second above and below a central zero position. The front column, toward the head of the vehicle, is marked off in per cent grade, above and below a zero.

The inertia of the mercury in the horizontal position, which is in line with the direction of motion, causes a change in the mercury levels in the vertical columns, directly in proportion to the rate of acceleration or retardation.

When the car is at rest, or moving at a uniform speed, the reading is zero. The meter has two adjustable clamps for fixing the zero position and to provide a damping effect.

Automotive Steel Still Dominates

Small Tonnage, But Orders Remain Big Factor for Steel Mills

NEW YORK, Jan. 5—Automotive commitments continued to be the steel market's dominant feature during the first business week of the new year.

Improvement in the demand is now beginning to make itself more tellingly felt in the operations of primary steel mills which for a long time had been lagging behind the rate at which finishing mills had been running.

In the Youngstown district gains in the operating rates of primary steel makers range from 15 to 20 per cent over the last week of 1932. Finishing mills have also been able to revise their operating rates moderately upwards.

Demand from motor car manufacturers and parts makers is giving sheet and strip as well as bar mills and alloy steel specialists a good start in the new year.

None of the individual orders entails anything like what under normal conditions would be singled out as representative tonnage business, but taken in the aggregate, and considering that the demand is virtually spread over the entire list of potential automotive buyers, the movement is generally acclaimed as very encouraging.

While recognizing that in the final analysis any marked growth in steel consumption by the automotive industries can only come as the result of a corresponding improvement in the public's purchases of cars and motor trucks, steel company sales managers take for granted a certain upswing in this direction and are pushing their sales efforts accordingly.

Prices come in for very little mention in the market, the general impression being that in most products desirable specifications continue to come in for moderate concessions.

Studebaker Gets Big Cut in White Melon

CLEVELAND, Jan. 3—Studebaker Corp., since it owns just short of 95 per cent of the outstanding common stock of the White Motor Co., received the greatest benefit from the $5 dividend declared by White directors.

The dividend is a direct distribution by the White Co., and is not the $5 cash offer, part of terms by Studebaker for White stock.

Besides treasury stock, there are 610,000 shares of White Motor common outstanding, all but about 30,000 shares of which have been deposited under terms offered by Studebaker and consequently are now owned by that company. On this basis the dividend amounted to about $2,900,000 for Studebaker.

"International" Trucks Shipped by Willys

Harvester Small Unit To Be Priced Low; 100 Daily is Scheduled

TOLEDO, Jan. 3—First shipment of ½-ton trucks made here by Willys-Overland for International Harvester Co. was sent out last week. The company is now on a schedule of 100 trucks daily, and first came off the line Dec. 23.

The trucks are labeled "International" on the hood and radiator shell. They are to be low in price and volume production is expected to result.

Several I. H. C. officials have been here recently to inspect the first of the trucks off the line. They included S. G. McAlister and C. R. Morrison, vice-presidents, and A. W. Scarratt, chief engineer.

G. V. Orr, vice-president of Willys-Overland Pacific Co. for 19 years in the company service in many sales capacities, has been named vice-president of the company and will have his headquarters here, it was announced by Chairman John N. Willys. He is succeeded on the Pacific Coast by Norman DeVaux.

Orr began as retail salesman in Des Moines, later was distributor in Waterloo, Iowa. Had charge of branches in Indianapolis and Chicago, then was regional manager in midwestern states and in last few years had charge of the Pacific territory.

Through additions to payrolls at Willys-Overland and Chevrolet, Toledo employment remains steady with weekly census showing 14,669 in 51 plants, mostly automotive.

Reynolds Shows Loss

DETROIT — Reynolds Spring Co., Jackson, Mich., reported net loss of $39,353 for quarter ended Sept. 30, 1932, after all charges, compared with net loss of $48,876 in the third quarter of 1931.

William A. Gray

William A. Gray, 76, treasurer of the Crescent Brass & Pin Co., died Dec. 6 after a prolonged illness.

He was a founder, with his brother, John A. Gray, of the Gray Brothers Carriage Works, which was succeeded by the Crescent Machine Co., and later changed its name to the Crescent Brass & Pin Co.

For many years this firm made the ignition systems for Ford cars, having made the ignition system for the first racing cars built by Henry Ford.

Evans Reports Loss

DETROIT, Dec. 30—Evans Products Co., has reported for nine months ended Sept. 30, 1932, a net loss of $159,145 after all charges including interest, compared with net loss of $6,964 in the corresponding nine months of 1931.

More Cars Stolen Than Sold in Chicago

CHICAGO, Jan. 3—Three times as many cars were stolen in November than new cars sold, police figures show.

During the month new registrations totaled 928, while 2738 automobiles were stolen.

In the same period police recovered 2582 stolen automobiles, a considerable number of them stripped of all accessories and equipment of value.

Lincoln Custom Salon Planned for New York

NEW YORK, Jan. 7—A salon presenting custom bodies on the Lincoln V12 145 chassis will be held at the Park Lane Hotel, New York, concurrently with the automobile show.

A similar presentation which also includes standard bodies on both the V12-136 and V12-145 chassis is being held at the Ford Motor Company show rooms at 1710 Broadway.

Marchal in U. S.

Pierre Marchal, president of Marchal Co., the largest manufacturer of automotive parts and accessories in France, has arrived to attend the National Automobile Show in New York and visit automotive plants in Detroit.

He is accompanied by Mr. Aylesworth, chief engineer, Hotchkiss Automobile & Ordnance plant, St. Dennis, France.

W. S. Killam

Walter S. Killam, 56, general manager of Capitol Brass Co., a division of Bohn Aluminum & Brass Corp., died Dec. 28 of a heart attack.

Detroit Aircraft Plan Approved

Stockholders Agree on New Corporation With Same Name to Carry On

DETROIT, Dec. 30—Detroit Aircraft Corp. stockholders approved a plan for reorganization looking to the revival of the corporation, at a special meeting Thursday. The company now is in receivership.

Under the plan, a new corporation of the same name will be organized to purchase at a judicial sale, the assets of the old Detroit Aircraft Corp. The new company will have an authorized capital stock of 200,000 shares of $1 par value. This stock will be offered in the ratio of one new share for every 10 shares of stock of the old company.

A new directorate and management has been arranged and the plan is supported by local industrial and financial leaders.

Nearly 100 stockholders attended the meeting and carried the measure without a dissenting vote.

The plan was prepared through the joint efforts of Baker, Simonds & Co., Detroit investment house, and Peter R. Beasley, who was president and in charge of the Aircraft concern's operations for the last 12 months before receivership.

Will Not Enforce Jersey Signal Law

TRENTON, N. J., Jan. 4—Vice-chancellor Buchanan of New Jersey recenty granted an order restraining Harold G. Hoffman, commissioner of motor vehicles, from enforcing the law requiring cars and trucks to have direction indicating signal devices.

The indications are that the state legislature will repeal the act, which provided that such devices should be installed prior to granting registration licences for 1933.

International Trucks Come Off Line At Willys-Overland Plant in Toledo

L. A. Miller, president, Willys-Overland Co., turning over the first small International Harvester trucks built by his company to I. H. C. officials at the Toledo plant

Hayes Body Payroll Largest in 18 Months

750 Employed on Continental, Reo and Austin Bodies; 1000 by Feb. 1, is Plan

GRAND RAPIDS, Jan. 4—Hayes Body Corp., building bodies for the Continental Automobile Co., now starting production of its new four-cylinder car, is employing more persons than at any time in the last 18 months, W. W. Hoagland, president, announced.

The payroll now includes 750 Grand Rapids residents, drawing $100,000 a month, and by Feb. 1 may be increased to 1,000 persons. With 1,000 at work, a new peak for the last three years will be reached.

Continental orders have made the increased employment possible, although it is not the only automobile manufacturer for which Hayes bodies are being built.

For the last two and a half months the Hayes tool department has been working day and night preparing for production of the three lines of Continental cars. In addition the company has a contract with the Reo Motor Car Co., for which it will start production this month. Willys-Overland Co. is purchasing body stampings for its new small car, and the American Austin Co. also purchases bodies here.

Continental expects to employ 1,000 men in Grand Rapids and Muskegon when production is at its peak this year, according to Ray Sackett, of the company's Detroit offices. He said the Continental has already spent more than $2,500,000 in preparation for its three new cars.

Racine Accessory Firm Organized

RACINE, Wis., Jan. 3—Electric Motor Corp., organized by I. H. Dunham to manufacture a new type of fractional horsepower motors for electrical appliances of various kinds, including automobile hot-water heater fans, has established its factory here and is now in production.

G.E. Develops Engine Heater

PITTSFIELD, MASS., Jan. 2—General Electric Co. has developed here an electric heater designed to keep an automobile engine in condition for easy starting during cold weather. The heater, of course, can be used only in a wired garage.

The device consists of a small 110-volt 100-watt, cartridge-type, immersion heating unit permanently located inside the circulating-water hose connection.

By connecting it after turning off the engine, the engine temperature is maintained without overheating until the car is next used. The heater is said to operate satisfactorily in the various anti-freeze solutions used in automobile cooling systems and can also be safely left in the water circuit during the summer.

Tests are said to have shown that with the automobile water heater used overnight, the car can be started without the excessive choking, oil dilution, and battery wear ordinarily experienced on cold mornings.

Brown Promotes Chance

Nelson E. Chance, formerly district manager of the Houston office of Brown Instrument Co., has been appointed assistant sales manager, with headquarters at Philadelphia. Mr. Chance has been with the company over 10 years.

Canadian G.M. Expands in Maritime Provinces

TORONTO, Jan. 2—General Motors of Canada, Ltd., is making a structural expansion in the Maritime Provinces, building a $60,000 warehouse and office facilities at Moncton, N. B., to take care of operations in the Atlantic Provinces.

Power Heads Ford Louisville Sales

A. S. Power, formerly Atlanta division, Ford Motor Co., has been sent to Louisville to manage the new factory sales division, operating as the Ford Motor Sales Co. (See page 781, Dec. 17, 1932, *Automotive Industries.)*

New York Show Week Events

	THURSDAY, Jan. 5	
8 P.M.	Stutz Dealer Meeting (There will be a meeting at Stutz headquarters every day during the Show from 4 to 5 P.M.)	16 W. 61st Street
	FRIDAY, Jan. 6	
	Packard Pre-Show Meeting and Luncheon	Hotel Astor
	Packard Dealer Luncheon	Hotel Roosevelt
	SATURDAY, Jan. 7	
10.30 A.M.	International Registration	NACC offices
	SUNDAY, Jan. 8	
11 A.M.	Stutz Export Organization	Hotel Commodore
	MONDAY, Jan. 9	
10 A.M.	AAA Contest Board Meeting (Luncheon)	New Yorker
10 A.M.-5 P.M.	National Auto Dealers Association Meeting	Hotel Commodore
12 Noon	American Automobile Association Meetings (Contest Board Safety Committee, Management and Personnel Training Committee and Membership and Sales Promotion Committee)	Hotel New Yorker
12.30 P.M.	Buick-Olds-Pontiac Dealer Luncheon	Hotel Commodore
12.30 P.M.	Marmon Dealer Luncheon	Hotel Commodore
12.30 P.M.	International Day Luncheon	NACC offices
1.30 P.M.	International Day Conference	NACC offices
6.30 P.M.	Rubber Manufacturers Association Dinner	Hotel New Yorker
6.30 P.M.	Met. Section, S.A.E., Dinner	New Yorker
7.00 P.M.	Combined Dealer Banquet of Chrysler, De Soto, Dodge and Plymouth organizations	71st Regiment Armory, 34th & Park Ave.
	TUESDAY, Jan. 10	
10 A.M.	AAA Directors Meeting	New Yorker
10 A.M.	Export Managers Meeting	NACC offices
12 Noon	Willys-Overland Dealer Luncheon	Hotel Commodore
	Auburn Dealer Luncheon	Hotel Commodore
12.30 P.M.	Reo Dealer Luncheon	Hotel Biltmore
	American Automobile Association National Board of Directors' Meeting	Hotel New Yorker
12.30 P.M.	Marmon Dealer Luncheon	Hotel Commodore
6.30 P.M.	National Automobile Chamber of Commerce Banquet	Hotel Commodore
	WEDNESDAY, Jan. 11	
10 A.M.	NACC Directors Meeting	NACC offices
12.30 P.M.	Cadillac Dealer Luncheon	Waldorf-Astoria
12.30 P.M.	Marmon Dealer Luncheon	Hotel Commodore
1.00 P.M.	NACC Directors Luncheon	
6.30 P.M.	Society of Automotive Engineers Annual Dinner	Hotel Pennsylvania
	THURSDAY, Jan. 12	
12.30 P.M.	Overseas Automotive Club Luncheon	Picadilly
12.30 P.M.	Marmon Dealer Luncheon	Hotel Commodore
	FRIDAY, Jan. 13	
12.30 P.M.	Marmon Dealer Luncheon	Hotel Commodore

Chicago Show Week Events

	MONDAY, Jan. 30	
12.30 P.M.	Buick-Olds-Pontiac Dealer Luncheon	Palmer House
7.00 P.M.	Chrysler, De Soto, Dodge and Plymouth Dealer Dinner	Naval Armory
	TUESDAY, Jan. 31	
12.30 P.M.	Auburn Automobile Dealer Luncheon	Stevens Hotel

Rising Exports Seen By Frank for 1933

Studebaker Pierce-Arrow Foreign Sales Head Is Confident of Increases

SOUTH BEND, Dec. 28—The European motor car business in 1933 will show an improvement over 1932, in the opinion of Arvid L. Frank, vice-president and general manager of Studebaker Pierce-Arrow Export Corp., who recently returned from the Continent, where he attended the ennual Brussels Automobile Show.

"Probably the best promise of increased business in 1933 lies in improved dealer morale, which is now the highest it has been in several years," he said. No change can be expected, he pointed out, in countries which are locked out by exchange restrictions and import quotas until these artificial barriers are removed.

"Tariff revisions and debt settlements are expected by Europeans to be the most important developments of the new year. Favorable solutions of these problems should stimulate all types of business in all countries.

"Exports by the American industry as a whole to Continental countries reached such a low level in 1932 that even a slight improvement in general conditions is expected to be reflected in motor car sales. Business reported by American manufacturers operating in Europe, including all major companies with the exception of one volume producer of small cars, showed a 40 per cent decrease for the first 10 months of 1932 from the corresponding 10 months in 1931."

While in Europe, Mr. Frank, who is a member of the export committee of the National Automobile Chamber of Commerce, addressed the American Automobile Club and spoke at the annual banquet given by The Studebaker Pierce-Arrow Export Corporation in honor of its European distributors and dealers.

Raybestos Enlarges Canadian Plant

TORONTO, Jan. 5—Canadian Raybestos Co., Ltd., Peterborough, Ont., manufacturing linings in the Dominion since 1920, has added two structures to its plant. Latest equipment is being used to produce all types of molded linings. About 90 per cent of Raybestos products are now made in the Dominion.

Toledo Steel Forms Canadian Subsidiary

TORONTO, Jan. 4—Toledo Steel Products Co., Ltd., has been organized here as a branch of the U. S. Company, A. F. Seubert is president; J. C. Adams, Toronto, vice-president, and H. E. Bremforder, secretary-treasurer.

Average Price-per-pound of Cars Drop, As Weights Increase During Six Years

In Each of Five Price Groups Steady Decrease in f. o. b. Prices Is Shown Since 1926; Hundreds of Models Checked in Determining Average Factors of Costs, etc.

By Marcus Ainsworth

PHILADELPHIA, Jan. 4—Price per pound of U. S. passenger cars has showed a marked drop since 1926, and average weights of cars have shown consistent gains in all price classes.

Computations of these changes, taking the average of all 5-passenger, 4-door sedans, show the f.o.b. price per pound was 63c. in 1926; 54c. in 1929 and 45c. in 1932. The average weight increased from 3330 lb. in 1926 to 3470 lb. in 1929 and 3840 lb. in 1932.

The average price of all 5-passenger, 4-door sedans was $2,100 in 1926; $1,989 in 1929 and $1,725 in 1932.

A further break-down appears in the following table:

PRICE CLASS	PRICE PER POUND 1926	1929	1932	AVERAGE WEIGHT 1926	1929	1932	AVERAGE PRICE 1926	1929	1932
Under $750	$0.30	$0.26	$0.23	2,137	2,453	2,770	$632	$647	$648
$750-$1,000	.37	.33	.28	2,470	2,750	3,180	905	907	883
$1,000-$1,500	.43	.43	.35	3,030	3,167	3,550	1,310	1,372	1,230
$1,500-$2,000	.56	.49	.40	3,330	3,520	4,250	1,875	1,715	1,700
$2,000 and up	.81	.74	.68	3,870	4,260	5,040	3,140	3,140	3,410

	Per Cent Change 1929 from 1926	1932 from 1929	Per Cent Change 1929 from 1926	1932 from 1929	Per Cent Change 1929 from 1926	1932 from 1929
Under $750	—13.2	—11.5	+10.5	+10.3	+2.4	None
$750-$1,000	—10.8	—15.0	+10.1	+10.6	None	— 2.7
$1,000-$1,500	None	—18.6	+ 0.5	+11.2	+5.0	—10.5
$1,500-$2,000	—12.5	—18.3	+10.2	+20.1	—8.5	— 0.8
$2,000 and up	— 8.6	— 8.0	+10.0	+18.3	None	+ 8.8

+ + CALENDAR OF COMING EVENTS + +

FOREIGN SHOWS

Canadian National Motor Show, Toronto ..... Jan. 14-21
Berlin International ..... Feb. 12-22

CONVENTIONS

Rubber Mfr.'s Assoc., New York City, Annual Meeting ..... Jan. 9
Metropolitan Section, S. A. E., Annual Automobile Show Dinner, New York ..... Jan. 9
Annual Society of Automotive Engineers Dinner—New York .. Jan. 11
Highway & Building Congress, Detroit ..... Jan. 16-20
American Road Builders' Annual, Detroit ..... Jan. 16-20
Steel Founders Soc. of America—Annual Meeting—Detroit ... Jan. 16-21
Annual Society of Automotive Engineers Meeting — Detroit Jan. 23-26
American Soc. for Testing Materials (Annual Meeting) ... June 26-30

SHOWS

National Automobile Show, New York ..... Jan. 7-14
Pacific Automobile Show, San Francisco ..... Jan. 7-14
Los Angeles, Calif., Automobile Show ..... Jan. 7-15
St. Louis, Mo., Automobile Show. Jan. 8-14
Buffalo, N. Y., Automobile Show Jan. 14-21
Canadian National Motor Show, Toronto ..... Jan. 14-21
Cleveland, Ohio, Automobile Show Jan. 14-21
Milwaukee, Wis., Automobile Show Jan. 14-21
Newark, N. J., Automobile Show Jan. 14-21
Natl. Motor Show of Canada, Toronto, Ont. ..... Jan. 14-21
Cincinnati, Ohio, Automobile Show ..... Jan. 15-21
Brooklyn, N. Y., Automobile Show Jan. 16-21
Philadelphia, Pa., Automobile Show ..... Jan. 16-21
Flint Automobile Show ..... Jan. 18-21
Motor Boat Show, Grand Central Palace, New York ..... Jan. 20-28
Baltimore, Md., Automobile Show Jan. 21-28
Detroit, Mich., Automobile Show, Jan. 21-28
Boston, Mass., Automobile Show Jan. 21-28
Hartford, Conn., Automobile Show Jan. 21-28
Pittsburgh, Pa., Automobile Show Jan. 23-28
Windsor, Ontario, Automobile Show Jan. 25-28
Harrisburg, Penna., Automobile Show ..... Jan. 25-28
Rochester, N. Y., Automobile Show ..... Jan. 28-28
Portland, Me., Automobile Show Jan. 28-Feb. 4
Washington, D. C., Automobile Show ..... Jan. 28-Feb. 5
National Automobile Show, Chicago ..... Jan. 28-Feb. 4
Springfield, Mass., Automobile Show ..... Jan. 30-Feb. 4
Lancaster, Pa., Automobile Show Feb. 1-4
Indianapolis, Ind., Automobile Show ..... Feb. 4-11
Omaha, Neb., Automobile Show, Feb. 6-10
Denver, Colo., Automobile Show Feb. 6-11
Springfield, Ill., Automobile Show Feb. 9-11
Kansas City Automobile Show .. Feb. 11-18
Toledo, Ohio, Automobile Show . Feb. 11-18
Rapid City, S. D., Automobile Show Feb. 14-18
Peoria, Ill., Automobile Show ... Feb. 15-19
Wichita, Kans., Automobile Show Feb. 21-24
Holyoke, Mass., Automobile Show ..... Feb. 22-25
Evansville, Ind., Automobile Show Feb. 24-26
Albany, N. Y., Automobile Show, Feb. 25-Mar. 4
Des Moines, Iowa, Automobile Show ..... Feb. 27-Mar. 4
Seattle, Wash., Automobile Show Feb. 26-Mar. 4

Simplification is Keynote of Oldsmobile Line

(Continued from page 8)

controls run diagonally to the wheels. The cables enter the front-wheel backing plates at the top, and the rear wheel at the bottom. Owing to the straight-line cable hook-up and the shortness of the cross shaft with its mounting in oil-less bearings, there is less friction, and the tension of the return spring therefore has been reduced. Guides for the cables are provided on the side rail.

New steel-spoke wheels, said to be lighter than wire wheels of equal size, are standard equipment on the new models. This wheel is of two-piece construction, its rim and felloe are integral, and the stamped spoke spider forms the second part, which is united to the first by riveting. These wheels are easier to clean than wood wheels, and they should keep their finish longer.

The bore of the six-cylinder engine has been increased 1/16 in., with a gain of several horsepower. With reduced weight of the car as a whole, this results in materially improved performance.

Other mechanical changes include the following:

Camshaft cam surfaces are tapered and cam followers are flat, to impart a turning motion to the tappet in its guide and reduce wear.

Fan speed has been reduced while maintaining ample cooling, with resultant decreased fan noise. Oldsmobile now makes its own fans.

The clutch pilot bearing is now of the ball type.

Piston pins are slightly larger in diameter. Batteries are now located under the seat where they are more accessible than under the floor board with all its insulation.

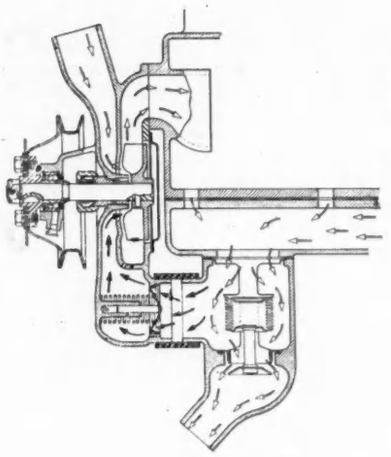
On the eight the clutch capacity has been increased by widening the facing. The outer diameter remains the same but the inner diameter is smaller. The six cylinder model now carries the same clutch as the eight.

Headlights now include a dimmer bulb, permitting elimination of the fender parking lights.

On the six the tires are slightly smaller in section, commensurate with the decrease in car weights. This also aids in reducing over-all height.

The leader of the new Oldsmobile lines, it is expected, will be the five-passenger six-cylinder coupe, which supersedes the former two-door sedan. In this model fender well mounting of spares and a trunk are not available. Fender well mounting is available in all other models of both the six and eight lines, with the exception of the standard sedan, while trunks are standard equipment on the touring sedan and touring five-passenger coupe. Other body models on both lines include a business coupe, a sport coupe with rumble seat, and a convertible roadster.

All body models have concealed aerials and lead-in wires for easy installation of radio equipment. Wiper motors are concealed. Instruments are grouped under two dials, indirectly lighted. A glove compartment is at the right of the instrument panel. Individual seats, where used, have form-fitting backs. Cushions are trimmed in pillow style, with mohair and whipcord optional. The new Fisher controlled-ventilation system is found on the Oldsmobile cars, of course, ventilators being located in all front windows and the rear quarter windows of four-door sedan models. Cowl ventilators are screened and larger, and windshields are locked in place.



Section through the thermostatic heat control, by-pass valve and water pump on the 1933 Oldsmobile

Attention should be called to the moulding treatment, two narrow adjacent beads overlapping at both ends and terminating at the cowl pillar and at the rear quarter panel, with no moulding across the back—an unusual effect. The sheet metal treatment also is highly unusual, as shown by the accompanying illustrations.

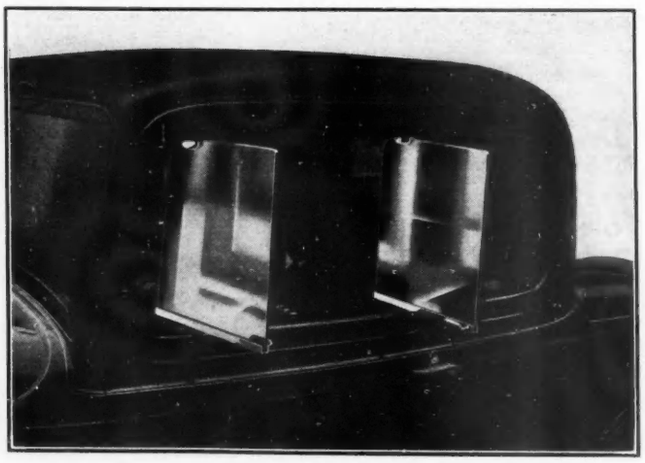
All sheet metal on Oldsmobile cars is now bonderized before painting as a protection against rust.

Dole Twin Windows

A NEW system of car ventilation by means of "twin windows" has been worked out by the Dole Valve Co. of Chicago. The doors of the car are provided with two pivotally-mounted windows. The forward one can be swung around to any angle to serve as a deflector, and the rear can then be swung into such a position that it will partly cover the opening behind the front window and prevent the air swirl forming at the edge of the forward window from entering the car.

This new system of ventilation is claimed to possess a number of advantages, such as providing nearly 8 in. more seat room, permitting of distinct interior treatment, and of making it an easy matter to arrange an arm rest, tool boxes, etc.

In case of breakage of one of the windows, it can be replaced at low cost, as it is not necessary to pull the door apart.



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PIERCE-ARROW
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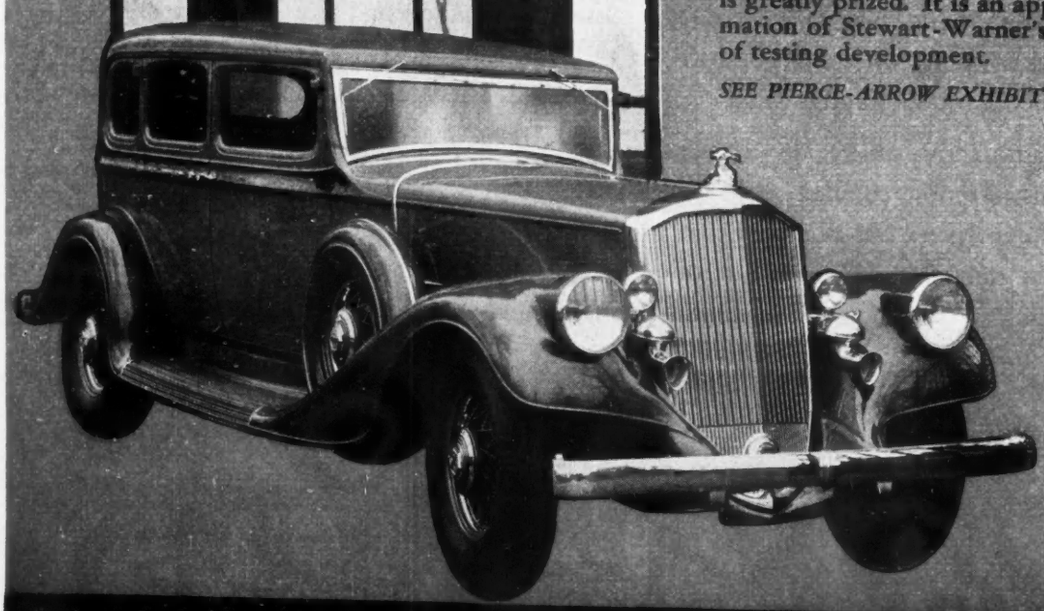
STEWART-WARNER
Automatic "*Full Power*" Brakes

Pierce-Arrow is the first American car to install *complete* Mechanical Power Brakes.

Pierce-Arrow Engineering Staff—after a year of rigorous road and laboratory test—chose Stewart-Warner Automatic "*Full Power*" Brakes as offering the ultimate in protection for Pierce-Arrow owners.

Such a decision from an organization which has upheld the highest standards of sound engineering practice for over three decades, is greatly prized. It is an appreciated confirmation of Stewart-Warner's 600,000 miles of testing development.

SEE PIERCE-ARROW EXHIBIT AT THE SHOWS



SEE DEMONSTRATING EXHIBIT OF STEWART-WARNER AUTOMATIC

WARNER

Power" BRAKES *will sell more cars* IN 1933

SEE ALL—COMPARE ALL BRAKE EXHIBITS AT THE SHOW. SUCH AN INVESTIGATION WILL CONFIRM THE FOLLOWING STATEMENTS:

Stewart-Warner offers the *only instantly responsive braking system* to utilize the giant force of car momentum as a braking force—under complete control of the driver.

A more accurate, more dependable control is assured by Stewart-Warner Automatic *"Full Power"* Brakes than by brakes using assistors such as vacuum boosters, or other devices to supplement human effort.

Power Unit independent of engine operation, as it utilizes car momentum as a braking force—a force that costs nothing—and is always proportioned to meet the needs of load, road and speed.

Saves split-seconds in braking. Stewart-Warner Brakes are faster. Driver's foot swings from accelerator to low Stewart-Warner Brake pedal instantly and he is braking before he could even *get* his foot on an *ordinary* brake pedal. —And 60% of full braking force is attained at a pedal travel which would barely *start* ordinary brakes into operation.

Straight-line Stopping. Even without the power unit, Stewart-Warner Wheel Brakes offer outstanding advantages over other pedal-operated jobs. Ask why these brakes are *safe* on curves —Why car stops in a straight line even on slippery pavement—Why adjustments are required only at from 10,000 to 20,000-mile intervals—Why adjustment requires only a wrench, screw driver, and a few moments' time.

Stewart-Warner Automatic *"Full Power"* Brakes are for factory installation, but we will be glad to give dealers and service men the full story. Our engineers are at the command of manufacturers of cars, motor coaches and trucks, who are looking for better brake protection to meet today's speeds and needs. Stewart-Warner Corporation, Brake Division, Chicago, or 6050 Cass Ave., Detroit.

© 1933 S. W. Corp.

HOW STEWART-WARNER AUTOMATIC "FULL POWER" BRAKES WORK

The human foot on the Stewart-Warner Brake Pedal—no higher than a foot accelerator—

controls this Mechanical Foot which harnesses the giant force of car momentum to apply—

these non-"grabbing" Stewart-Warner rigid, two-shoe, Wheel Brakes.

"Full Power" BRAKES AT THE NEW YORK AND CHICAGO SHOWS

YOU CAN PROFIT BY THE FACT THAT

Continental

has powered more than 100 different makes of passenger cars

Continental has been a vital part of the automotive industry for more than 30 years. *You* can profit by the vast resources, the well-equipped plants and facilities which have been developed over this period. *A dependable, economical source of supply is part of Continental's service.*

●

Continental has produced more than 3,500,000 Red Seal Motors. *You* can profit by the thorough understanding of gasoline power requirements this diversified experience has given us. *A power analysis, checked back upon existing records, is part of Continental's service.*

●

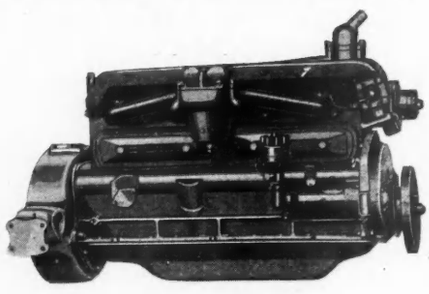
Continental has powered more than 100 different makes of passenger cars. *You* can profit by the things this practical proving ground has taught us. *Saving expense through experience is part of Continental's service.*

●

Continental, in 1932, sold more aircraft engines in its power class than all other manufacturers combined. *You* can profit by the specialized ability which has enabled us to satisfy the aircraft industry's demand for unfailing performance. *The coordination of facts learned in many fields is part of Continental's service.*

●

Continental has supplied engines to almost 300 manufacturers of industrial and agricultural machinery and to many makers of buses and boats. *You* can profit by the far-reaching study and research this opportunity has caused us to conduct. *Providing authoritative data on every phase of gasoline power application is part of Continental's service.*



Continental's laboratory engineering facilities are at your disposal. We invite you to write.

Continental Engines

CONTINENTAL MOTORS CORPORATION

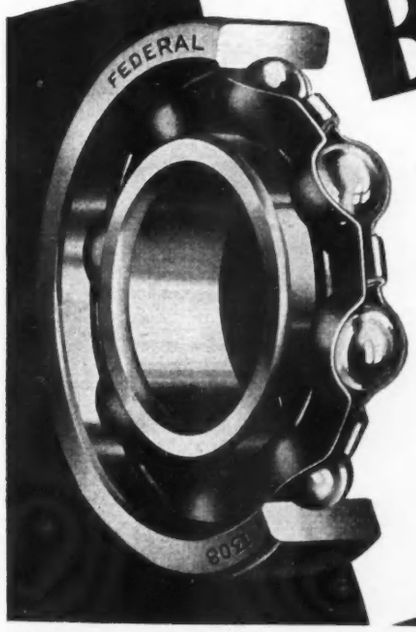
Offices: **Detroit, Michigan**
Factories: **Detroit and Muskegon**

Accuracy—Quality—Endurance

FOR many years, automotive engineers have shown a decided preference for FEDERAL BEARINGS. This preference is based, not upon theory, or price, but upon the actual record of performance in many locations in America's leading automobiles.

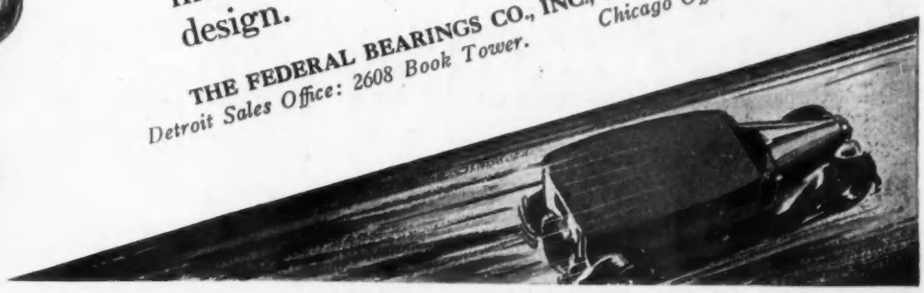
Only the finest steels, scientifically heat-treated and thru-hardened are used. Accuracy and precision rigidly observed during each process of manufacture. The great Federal plant is equipped with every known device that will contribute to ball bearing quality. Nothing is overlooked, or slighted, even down to the smallest detail.

FEDERAL BEARINGS



Engineers who demand highly efficient bearing service are seldom satisfied with anything less than "FEDERAL" quality. These bearings keep pace with the fast-moving trend in modern automotive design.

THE FEDERAL BEARINGS CO., INC., POUGHKEEPSIE, N. Y.
Detroit Sales Office: 2608 Book Tower. *Chicago Office: 102 N. Peoria St.*



Public Opinion says, "Give us POWER BRAKES"

LIGHTER, faster cars, for more and more speed—this is the modern trend in automotive engineering.

To match this steadily growing speed with adequate, positive control, power brakes are not simply desirable; *they are essential, absolutely necessary.*

Get this fact: Vacuum is the simplest, most exactly controllable, most reliable and most economical power for brakes on motor cars.

The obvious next step is—B-K Vacuum Power Brakes; for easy, safe, comfortable CONTROL.

BRAGG-KLIESRATH
401 Bendix Drive,
(Subsidiary of Bendix

1933 is the "POWER BRAKE YEAR"

BENDIX

Experience says, "Use VACUUM!"

You know this splendid unit. It has won its high place through sheer merit; through years of brilliant performance as standard equipment on many leading makes of bus, truck, trailer and now fine motor cars! B-K Vacuum Power Brakes have made *all* roads safer to travel.

Significant at the Auto Shows will be the immense preponderance of 1933 quality cars equipped with B-K Vacuum Power Brakes.

BK VACUUM POWER BRAKES
A BENDIX PRODUCT

CORPORATION
South Bend, Indiana
Aviation Corporation)

and 96% of all power brakes are BENDIX PRODUCTS

More than 20 YEARS OF SERVICE TO THE AUTOMOTIVE INDUSTRY

MORSE EQUIPPED

CADILLAC V-8	HUPMOBILE 8—"226"
CADILLAC V-12	LA SALLE 8
CADILLAC V-16	LINCOLN 8
CHRYSLER 6	LINCOLN V-12
CHRYSLER ROYAL 8	PLYMOUTH 6
CHRYSLER IMPERIAL 8	PONTIAC 8
DE SOTO 6	Manufacturers of high grade Eights—(Name upon request)
DODGE 6	
ESSEX 6	REO 8—FLYING CLOUD
HUDSON 8	REO 8—ROYALE
HUPMOBILE 8—"222"	ROCKNE 65

ABOVE and beyond anything which might be said of the correctness of design and the quality of Morse Silent Chains, is the actual performance records which call for little or no comment. On more than five million cars, during the last twenty years, Morse Silent Chains have written an "advertisement" impossible of expression in mere type.

They have made it possible, times without number, for automotive engineers to insure for their creations, qualities of quietness and reliability which would otherwise have been impossible.

MORSE CHAIN COMPANY

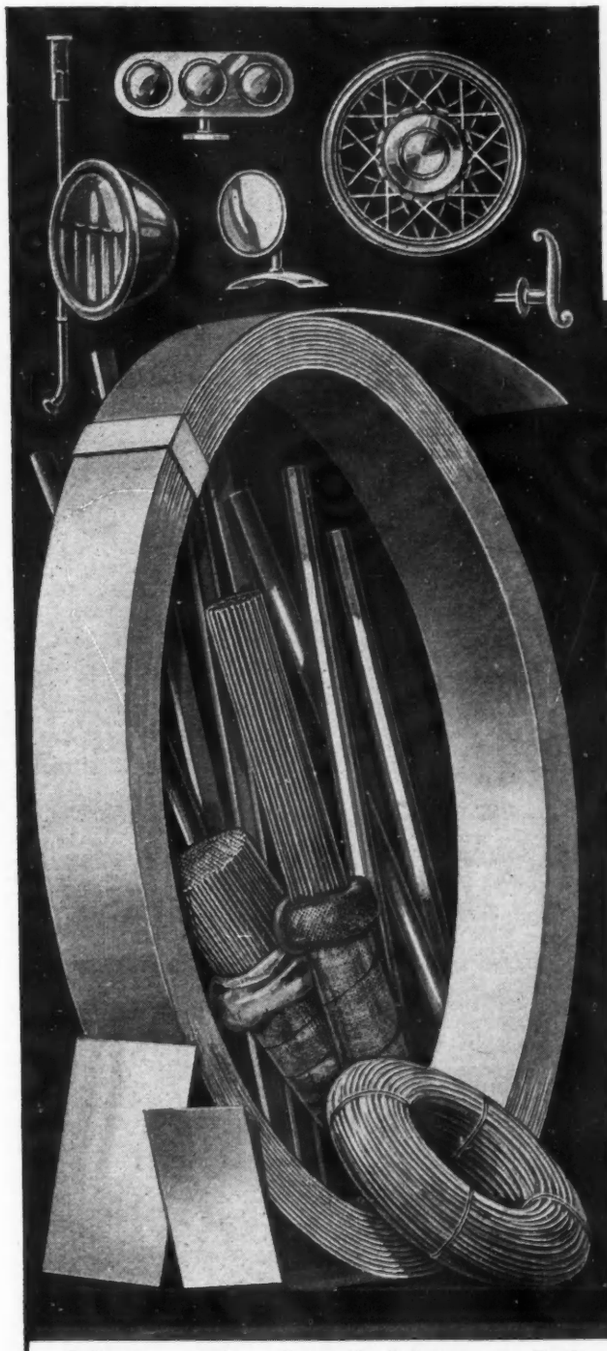
Division of Borg-Warner Corporation

ITHACA, NEW YORK DETROIT, MICHIGAN

Morse Chain Co., Ltd., Letchworth, Herts, England

MORSE

GENUINE *SILENT* CHAINS



USS STAINLESS AND Heat Resisting ALLOY STEELS

COLD ROLLED STRIP STEEL
WIRE AND WIRE PRODUCTS

Making Good Products Better

Many fabricators seeking to raise their products above competitive levels have found their answer in Chromium and Chromium-Nickel Alloy Steels. Immune—within practical limits—to corrosive influences, these alloys retain their beautiful silvery surface, with a minimum of care. Longer-lived, tremendously strong, they are surprisingly ductile, economically fabricated.

The six U S S compositions for these alloys meet the widest range of applications. They properly represent the application of our resources, research and production facilities. Upon request we shall be glad to send you an interesting booklet on U S S Chromium and Chromium-Nickel Alloy Steels.

USS STAINLESS AND Heat Resisting ALLOY STEELS

CHROMIUM-ALLOY STEELS	CHROMIUM-NICKEL STEELS
Ferritic	Austenitic
USS 12	USS 18-8
USS 17	USS 18-12
USS 27	USS 25-12

U S S Chromium-Nickel Alloy Steels are produced under licenses of the Chemical Foundation, Inc., New York; and Fried. Krupp A. G. of Germany.

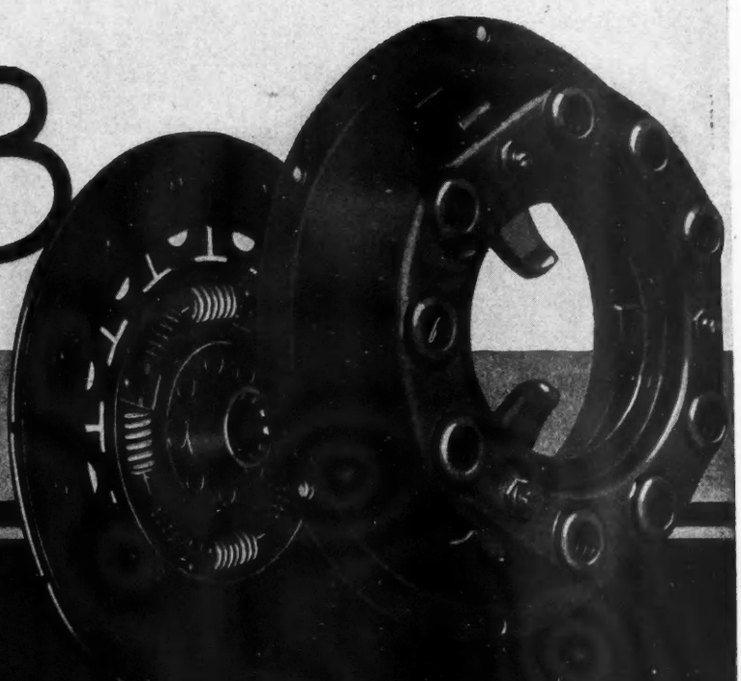
1831 — MORE THAN 100 YEARS of PROGRESS in WIRE MAKING — 1933

AMERICAN STEEL & WIRE COMPANY

208 South LaSalle Street, Chicago — SUBSIDIARY OF UNITED STATES STEEL CORPORATION — And All Principal Cities

Pacific Coast Distributors. Columbia Steel Company, Russ Building, San Francisco — *Export Distributors:* United States Steel Products Company, New York

Answering the requirements of 1933



BORG & BECK

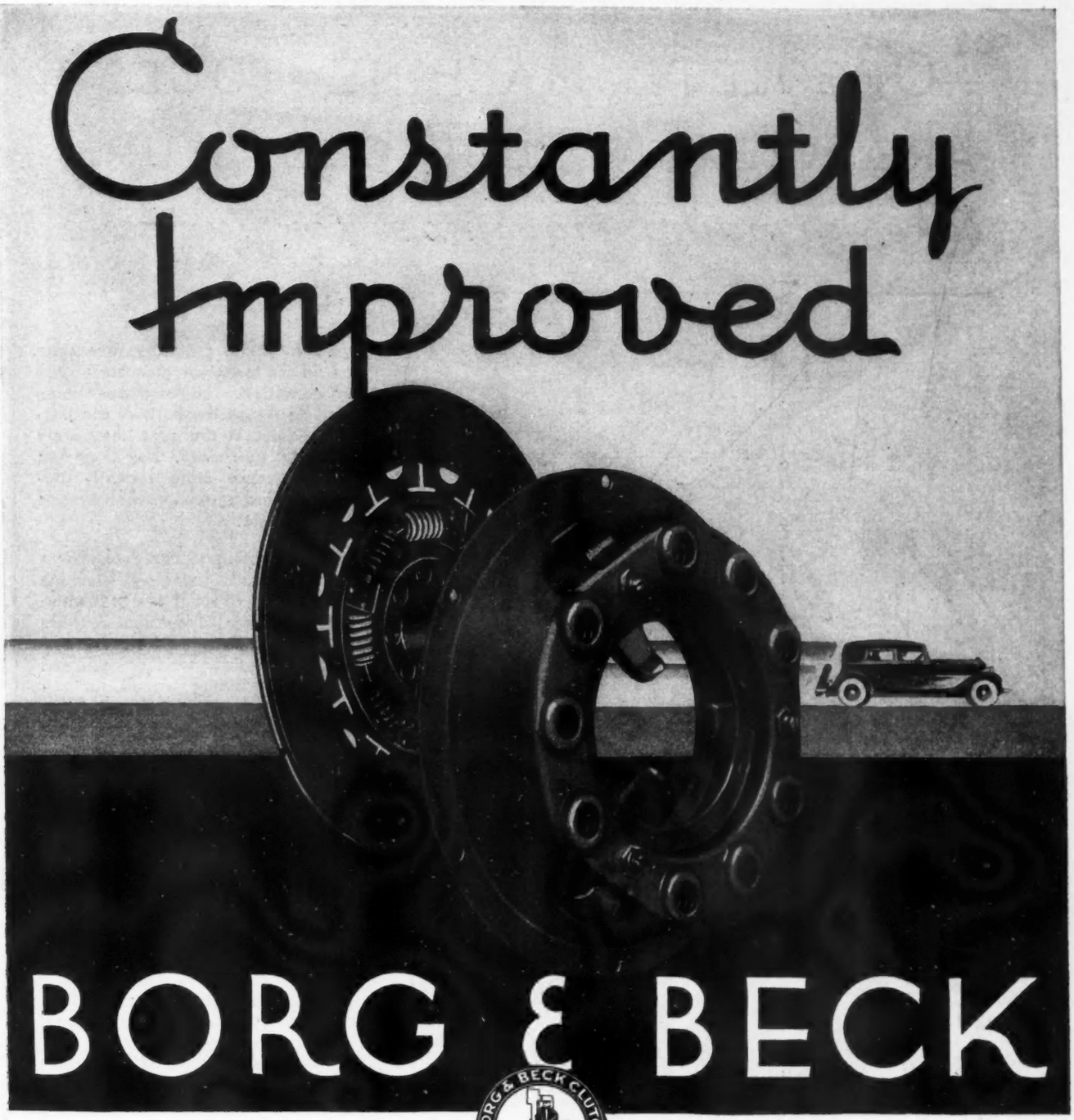
BORG & BECK CLUTCH · THE STANDARD

YOU'LL find Borg & Beck clutches standard on a large number of the 1933 models. Automotive engineers have selected Borg & Beck clutches because they meet the exacting requirements of 1933 automotive construction.

Borg & Beck means competent engineering, comprehensive manufacturing facilities and a sure source of supply.

THE BORG & BECK COMPANY · 6558 SOUTH MENARD AVE., CHICAGO, ILL.
DIVISION OF BORG-WARNER CORPORATION

Constantly Improved



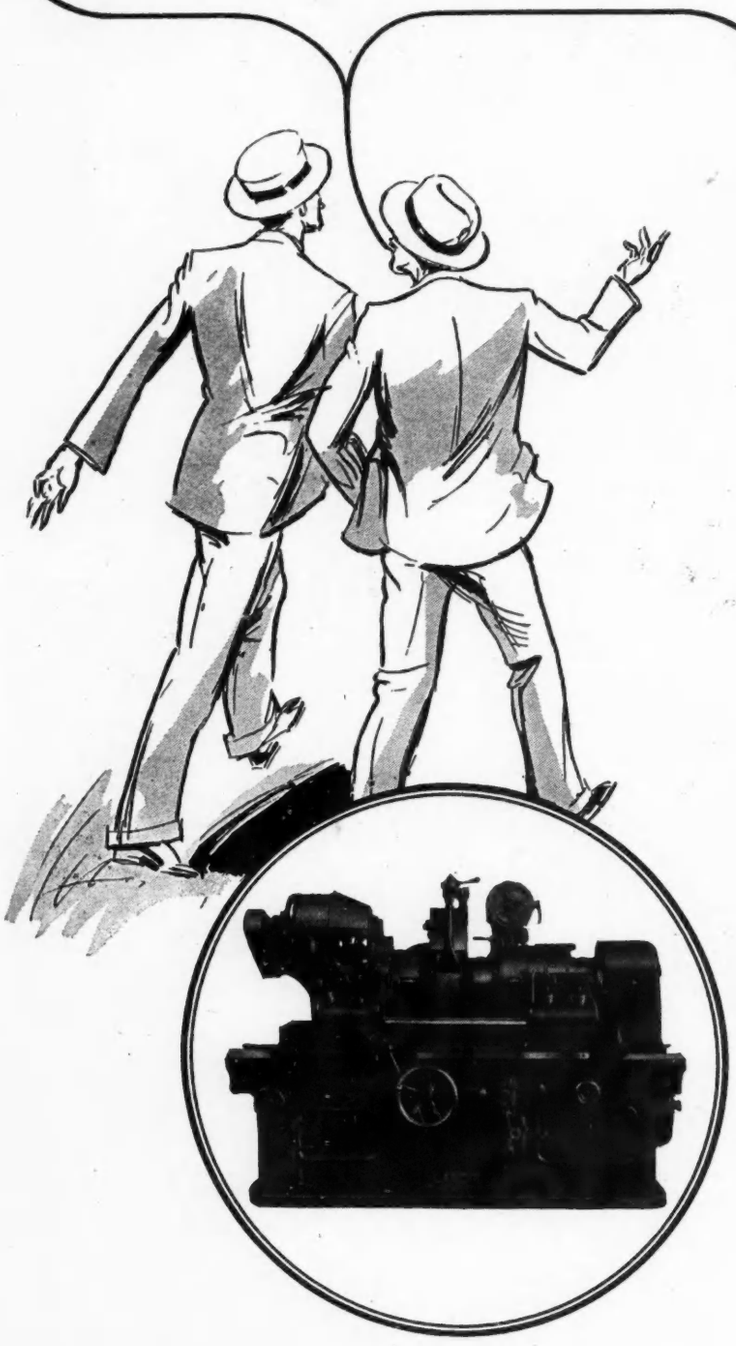
BORG & BECK

BORG & BECK leadership is maintained through constant improvement in Borg & Beck Clutches. Every advance in motor car construction—new speeds, smoothness and riding comfort, finds its counterpart in finer and better Borg & Beck Clutches.

THE BORG & BECK COMPANY · 6558 SOUTH MENARD AVE., CHICAGO, ILL.
DIVISION OF BORG-WARNER CORPORATION

"OBSOLETE MACHINE TOOLS ARE KEEPING YOUR COSTS UP

Take grinding machines for example



HUNDREDS, probably thousands, in use today are mechanically in fair condition. They are performing satisfactorily on the basis of the possible output at the time they were originally purchased. But they are costly because more recently developed grinding equipment has made them obsolete.

An interesting example of how a modern Landis Grinding Machine brought costs down is the following: A manufacturer of automotive parts installed a Landis 10-inch Type B Plain Hydraulic Grinder equipped with three grinding wheels for the multiple wheel grinding of stub shafts. The three diameters of the shaft were then ground at the rate of 180 complete pieces per hour, removing .015-inch to .020-inch stock. The wheels were only dressed every 100 pieces. During short periods of time as many as 5 pieces were ground per minute. Previously three grinding operations were employed, all of which meant the use of three machines and three operators or changing the set up three times on the same machine.

Increased production was the outstanding benefit derived from ceasing to use obsolete machines and an obsolete method. There were other benefits, however, such as greater accuracy, better finish, lower grinding wheel costs, a greater choice of speeds and feeds, greater power, greater accessibility for adjustment and less floor space.

It is quite logical that the Landis Tool Company, manufacturers of precision grinding machines for over forty years, should be showing the way in the direction of reduced costs by the replacement of obsolete grinding machines with modern grinding machines. Give them an opportunity and they will show you. "

LANDIS TOOL CO. WAYNESBORO PA
DETROIT·CHICAGO·NEWARK·PHILADELPHIA

126

HARRISON

RADIATORS

OIL TEMPERATURE REGULATORS

THERMOSTATS

SHUTTERS

HEATERS

PRODUCTS OF

HARRISON RADIATOR CORPORATION

LOCKPORT, N. Y.

IS IT NEW?... *but above all* IS IT IMPORTANT?

These are the twin standards by which articles appearing in *Automotive Industries* are selected. The importance of the men who read the publication makes such selection of paramount interest to them. The readers of *Automotive Industries* are key men in automotive plants; men who control purchasing power. They favor an automotive publication which is terse, accurate, dependable. *Automotive Industries* meets the needs of such men in hundreds of automotive manufacturing plants in the United States and in more than a score of foreign countries.

AUTOMOTIVE INDUSTRIES

Thirty-fourth year

A Chilton Class Journal Publication

Chestnut and 56th Streets

PHILADELPHIA

Cable address: "Autoland"

CURTIS CLUTCH DISCS

CURTIS Clutch Discs are furnished in high carbon, alloy or mild steel, also non-ferrous materials. Plain or slotted, flat or formed, ground and polished, tempered or untempered, as any size.

Only long experience in the manufacture of Clutch Discs can tell a manufacturer what is necessary for satisfactory performance in automobile, truck or tractor service.

This company has concentrated its efforts for years on the manufacture of custom-built Clutch Discs of precision. The result of that skilled experience shows in the perfection of its finished product.

And because of solving so many perplexing problems in this field, the Curtis Company is particularly qualified to give expert advice as to your particular needs. Correspondence is invited.

CURTIS CLUTCH DISC CO.
Division of Curtis
Manufacturing Company
1917 Kienlen Ave.
St. Louis, Mo.

Colloidal Graphite

dag
COLLOIDAL GRAPHITE PRODUCTS

A lubricant -not a lapping compound

THE surfaces of new shafts and bushings, though carefully machined, ground or reamed, are surprisingly rough and irregular.

Running-in with ordinary lubricants is a time-consuming smoothing process whereby the oil-free high spots are sheared or abraded.

By the employment of assembly and running-in lubricants charged with *colloidal* graphite, the friction parts take on a high polish, "limbering-up" time is reduced, lubricating films of much slighter thickness become admissible and greater loads may be sustained.

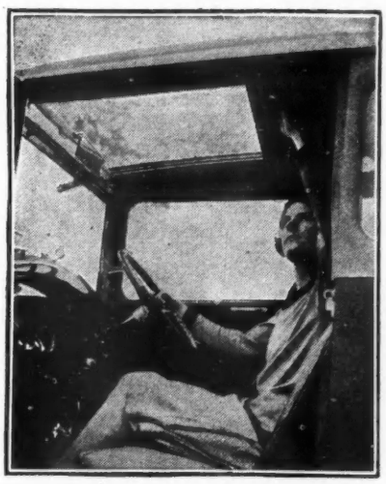
For technical details send for Bulletin No. 113.

ACHESON OILDAG CO.

Manufacturers of Colloidal Graphite Products

PORT HURON, MICH.

Weathershields Ltd Patented SLIDING ROOF



Specially Designed for Mass Production Jobs

Its Outstanding Features Are:

1. Absolutely weatherproof and rattle-proof
2. Creates no draught in winter and gives ideal ventilation in summer
3. Enables passengers to view scenery, buildings, etc., and have the benefit of the sunlight
4. Easily operated by central handle while driving and locks in any position
5. Can be used as a stand at aviation meetings and as an exit in case of accidents.

We are prepared to grant licenses to reputable firms to incorporate this feature in their bodies.

Export Agent and Sales Engineer

HUGH GREEN, M. I. Auto. E., A.M.I.M.E.
2, Queen's Road, Coventry, ENGLAND

WEATHERSHIELDS LTD., MOOR STREET BIRMINGHAM, ENGLAND

SCIENTIFIC MATHER SPRINGS

The Mather ideal has always aimed at quality instead of solely at price.

THE MATHER SPRING COMPANY
TOLEDO, OHIO

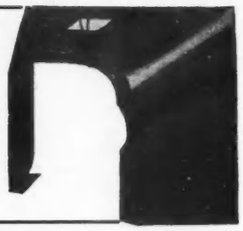
Manufacturers of Scientifically Heat Treated Automobile Springs

Greenlee
BROS. & CO.
ROCKFORD, ILLINOIS, U.S.A.
MULTIPLE SPINDLE DRILLING AND TAPPING MACHINES.
AUTOMATIC SCREW MACHINES. SPECIAL MACHINERY

DILECTO
DILECTO insulating sheets, rods, tubes and special shapes.
Also CELORON Timing Gears and Diamond Vulcanized Fibre.
CONTINENTAL-DIAMOND FIBRE CO.
Newark, Delaware

GEARED TO MEET TODAY'S NEEDS
COMMON-SENSE
Window Regulators
LET'S GET TOGETHER
ACKERMAN-BLAESSER-FEZZEY, INC.
1258 Holden Ave. Detroit, Mich.

AUTOMOTIVE PARTS
COWLS, HOODS, MUFFLERS,
FUEL TANKS
We own dies that will make savings for you.
Send inquiries—
WESTERN METAL SPECIALTY CO.
3043 No. 30th St.
MILWAUKEE, WISCONSIN



THE ELECTRIC FURNACE CO.
SALEM, OHIO
Send for BULLETINS
ELECTRIC AND FUEL FIRED FURNACES

GUNITE
ROCKER ARMS
CLUTCH PRESSURE PLATES
GUNITE FOUNDRIES CORP., ROCKFORD, ILLINOIS

BUYERS' GUIDE

Automotive Products and Factory Equipment Manufactured by Advertisers in This Issue

See Alphabetical List of Advertisers on Page 59

This Advertiser's Index is published as a convenience, and not as part of the advertising contract. Every care will be taken to index correctly. No allowance will be made for errors or failure to insert.

Arms & Knuckles, Steering
Atlas Drop Forge Co.

Axles
Atlas Drop Forge Co.
Park Drop Forge Co.
Timken-Detroit Axle Co.

Bearings, Anti-Friction
Ball
Federal Bearings Co., Inc.
Roller
Hvatt Roller Bearing Co.

Bending & Straightening Machines
Chambersburg Engineering Co.
Chambersburg-National Co.
Cleveland Punch & Shear Works Co.
National Machinery Co.

Blanks
Forged
Atlas Drop Forge Co.

Boring Machines
Baker Brothers, Inc.
Foote-Burt Co.

Brake Boosters
Bragg Kliesrath Co.
Stewart-Warner Corp.

Brake Drums
Gunite Foundries Corp.

Brakes
Mechanical
Stewart-Warner Corp.

Brass Specialties
Dole Valve Co.

Bumpers
Stewart-Warner Corp.

Bushings
Fibre
Continental-Diamond Fibre Co.

Cable
Brake or Cutout Control
American Steel & Wire Co.
Ignition, Starting & Lighting
American Steel & Wire Co.

Camshafts
Atlas Drop Forge Co.
Gunite Foundries Corp.

Castings
Gray Iron
Gunite Foundries Corp.

Chains
Front-End
Morse Chain Co.

Channels for Glass
Felt
American Felt Co.

Cleaners
Metal
American Chemical Paint Co. (Rust Preventive)

Clutches
Borg and Beck Co.
Long Manufacturing Co.

Compressors, Air
Curtis Pneumatic Machinery Co.

Connecting Rods
Atlas Drop Forge Co.
Wyman-Gordon

Couplings
Pipe and Tubing
Dole Valve Co.
National Tube Co.

Cranes
Portable
Curtis Pneumatic Machinery Co.

Crankshafts
Atlas Drop Forge Co.
Park Drop Forge Co.
Wyman-Gordon

Cutters
Baker Brothers, Inc. (Keyseating)
Davis Keyseater Co. (Keyseating)
Fellows Gear Shaper Co. (Gear)

Dashes, Truck
Stopler Steel Products Co.

Dies, Jigs & Fixtures
Western Metal Specialty Co.

Disks, Clutch
Borg and Beck Co.
Curtis Clutch Disc Co.

Drilling Machines
Baker Brothers, Inc.
Foote-Burt Co.
Greenlee Brothers and Co. (Multiple Spindle)

Enamels
American Chemical Paint Co. (Rust Proofing)

Engines
Continental Motors Corp.
Waukesha Motor Co.

Felt
American Felt Co.

Fenders
Stopler Steel Products Co.

Fibre Rods, Sheets, Tubes
Continental-Diamond Fibre Co.

Forgings
Atlas Drop Forge Co.
Park Drop Forge Co.
Wyman Gordan

Furnaces Electric
(Annealing, Carburizing, Heat Treating, Forging & Welding)
Electric Furnace Co.
Pittsburgh Lectromelt Furnace Corp.
Melting
Pittsburgh Lectromelt Furnace Corp.

Gaskets
Felt
American Felt Co.

Gear Cutting Machines
Fellows Gear Shaper Co. (Shapers)

Gear Material
Non-Metallic
Continental-Diamond Fibre Co.

Gears, Timing
Non-Metallic
Continental-Diamond Fibre Co.

Grinding Machines
Fellows Gear Shaper Co.
Landis Tool Co.
Universal
Landis Tool Co.

Hammers, Power
Chambersburg Engineering Co.
Chambersburg-National Co.
National Machinery Co.

Heat Treating
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.

Heaters, Car
Stewart-Warner Corp.

Hoists, Portable
Curtis Pneumatic Machinery Co.

Hoods
Stopler Steel Products Co.

Hose, Flexible Metallic (Radiator & Fuel Lines)
Titeflex Metal Hose Co.

Hubs, Wheel
Gunite Foundries Corp.

Insulating Material
Continental-Diamond Fibre Co.

Keyseaters
Baker Brothers, Inc.
Davis Keyseater Co.

Lapping Machines
Fellows Gear Shaper Co.

Lathes
Automatic Chucking
Potter & Johnston Machine Co.
Turret
Potter & Johnston Machine Co.

(Continued on page 58)

DEOXIDINE— Prepares Auto Bodies for Painting
RODINE— Pickle Bath Control
STRIPPLE High Speed Enamel Remover
PEROLINE— Rust Preventing Oil
KEMICK— Manifold Paint
FLOSOL— Soldering Flux
PARADOX— Rust Proofing Enamel

AMERICAN CHEMICAL PAINT CO.
AMBLER, PENNA.

BAKER

DRILLING : BORING and TAPPING EQUIPMENT

A complete line including gear or hydraulic feed, single or multiple spindle; vertical, horizontal and way type.

BAKER BROTHERS, INC. TOLEDO, OHIO

IRON AND STEEL MELTING AND REFINING FURNACES

PITTSBURGH LECTROMELT FURNACE CORP. PITTSBURGH, PA. P. O. Box 1125

LECTROMELT IRONS ARE USED FOR CAMSHAFTS, CRANKSHAFTS, PISTONS, PISTON RINGS, CARBURETORS, ETC.

STAMPINGS

WORCESTER STAMPED METAL © · QUALITY STAMPINGS

Heavy, medium and light stampings in any quantity. A steady flow of production—*when* you want it.

WORCESTER STAMPED METAL CO. Worcester, Mass.

WORCESTER STAMPED METAL © · QUALITY STAMPINGS

PIG IRON
SEMIFINISHED STEEL
BARS & SHAPES

SKELP
SHEETS
PIPE
SPECIALTIES

ENDURO-REPUBLIC'S PERFECTED STAINLESS STEEL
AGATHON ALLOY STEELS

REPUBLIC STEEL CORP.
YOUNGSTOWN, OHIO

Rx

Send your sales message to the world's richest industrial market through the advertising pages of

Automotive Industries

A CHILTON CLASS JOURNAL PUBLICATION

Chestnut and 56th Streets
Philadelphia

"AUTOMOTIVE HEADQUARTERS"

UBP AUTOMOTIVE DIVISION — DIVISION OF UNITED BUSINESS PUBLISHERS INCORPORATED

Steam Cooling

PRACTICALLY ELIMINATES CRANKCASE DILUTION

Rushmore Laboratory

PLAINFIELD · NEW JERSEY

PJ FOR OVER A QUARTER OF A CENTURY PJ

THE PIONEER MANUFACTURER OF AUTOMATIC CHUCKING EQUIPMENT

POTTER & JOHNSTON MACH. CO.
PAWTUCKET, R. I., U. S. A.

EXPANSION PLUGS

FOR CLOSING CORE HOLES

COILED and FLAT SPRINGS
PHOSPHOR BRONZE SPRINGS A SPECIALTY

SMALL STAMPINGS
WASHERS and SPRING COTTERS

WIRE SHAPES

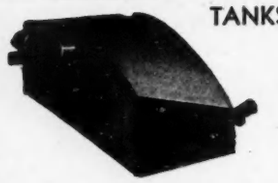
M. D. HUBBARD SPRING CO.
620 SOUTH BLVD. PONTIAC, MICHIGAN

FELT

AMERICAN FELT CO.
NEW YORK DETROIT CHICAGO

CLEVELAND
POWER FOR PROFITABLE PRODUCTION PRESSES

THE CLEVELAND PUNCH & SHEAR WORKS COMPANY
CLEVELAND, OHIO



TANKS : HOODS : FENDERS

Years of experience in the production of both stamped and fabricated automotive products, to specifications, enable us to meet the most fluctuating production schedules unerringly. We will gladly submit estimates on request.

Stolper Steel Products Corp.
3310 Fond du Lac Ave.
Milwaukee, Wis.

DAVIS KEYSEATER

This low cost machine will handle any keyseating job in the shop up to 1 in.

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Alloy
Republic Steel Corp.
Bars
Republic Steel Corp.
Carbon
Republic Steel Corp.
Cold Drawn
American Steel & Wire Co.
Republic Steel Corp. Inc.
Spring
Barnes - Gibson - Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D. Co.
Stainless
Republic Steel Corp.
Strip
American Steel & Wire Co.
Republic Steel Corp.
Thomas Steel Co.

Molded or Machined Parts (Phenolic)
Continental-Diamond Fibre Co.

Name Plates
Auld, D. L., Co.

Oil
Break In
Acheson Oildag Co.
Lubricating
Acheson Oildag Co.

Pads
Felt
American Felt Co.

Paints
American Chemical Paint Co. (Heat Resisting).

Pickling Compounds
American Chemical Paint Co.

Pipe Wrought Steel
National Tube Co.

Plates, Clutch Pressure
Gunite Foundries Corp.

Plugs, Expansion
Hubbard Spring Co., M. D.

Powerplants, Industrial
Waukesha Motor Co. (Portable)

Presses
Chambersburg Engineering Co.
Chambersburg-National Co.
Cleveland Punch & Shear Works Co.
National Machinery Co.

Primers, Gasoline
Dole Valve Co.

Punches
Cleveland Punch & Shear Works Co.

Radiators
Harrison Radiator Corp.
Long Manufacturing Co.

Removers, Enamel & Paint
American Chemical Paint Co.

Rust Removers & Preventives
American Chemical Paint Co.

Screw Machine Products
Barnes, Wallace Co.

Screw Machines
Greenlee Brothers & Co.
Potter & Johnston Machine Co.

Shears
Cleveland Punch & Shear Works Co.

Sheet Metal Machines
Cleveland Punch & Shear Works Co.

Shock Absorbers
Stewart-Warner Corp.
John Warren Watson Co.

Special Machinery
Baker Brothers, Inc.
Greenlee Brothers & Co.

Speedometers & Tachometers
Stewart-Warner Corp.

Springs
Extension, Compression, Torsion or Flat
American Steel & Wire Co.
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Mather Spring Co.
Raymond Mfg. Co.
Leaf
Mather Spring Co.
Valve
American Steel & Wire Co.

Stampings or Drawings Metal
Auld, D. L., Co.
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Cook Spring Div.
Gibson, Wm. D., Co.
Hubbard Spring Co., M. D.
Raymond Mfg. Co.
Stopler Steel Products Co.
Western Metal Specialty Co.
Worcester Stamped Metal Co.

Starters, Electric
Delco-Remy Corp.

Steam Cooling
Rushmore Laboratory

Steel
Cold Drawn
American Steel & Wire Co.
Spring
Barnes-Gibson-Raymond, Inc.
Barnes, Wallace Co.
Gibson, Wm. D., Co.
Strip
American Steel & Wire Co.
Thomas Steel Co.

Systems, Ignition
Delco-Remy Corp.

Tank Support Straps
Stopler Steel Products Co.

Tanks
Stopler Steel Products Co.
Western Metal Specialty Co.

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Foote-Burt Co.
Greenlee Brothers & Co.

Thermostats
Dale Valve Co.

Thread Generators
Fellows Gear Shaper Co.

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Curtis Pneumatic Machinery Co.

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Ohio Seamless Tube Co.

Tubing
Flexible Metal
Titeflex Metal Hose Co.
Seamless
Ohio Seamless Tube Co.
Steel
National Tube Co.
Ohio Seamless Steel Co.

Tubular Products
Ohio Seamless Tube Co.

Turret Machines Automatic
Potter & Johnston Machine Co.

Vacuum Tanks
Stewart-Warner Corp.

Ventilators
Weathershields, Ltd.

Visors, Windshield
Weathershields, Ltd.

Washers
Felt
American Felt Co.
Lock
Shakeproof Lock Washer Mfg. Co.
Plain Metal
Hubbard Spring Co., M. D.

Welding Material (Wire)
American Steel & Wire Co. (Wires & Electrodes)

Wicks
Felt
American Felt Co.

Window Regulators
Ackerman-Blaesser-Fezzey, Inc.

Windshield Wipers
Stewart-Warner Corp.

Wire
Flat, Round, Square or Special Shape
Barnes, Wallace Co.
Spring
American Steel & Wire Co.
Barnes, Wallace Co.
Republic Steel Corp.

Wrenches
Gunite Foundries Corp.

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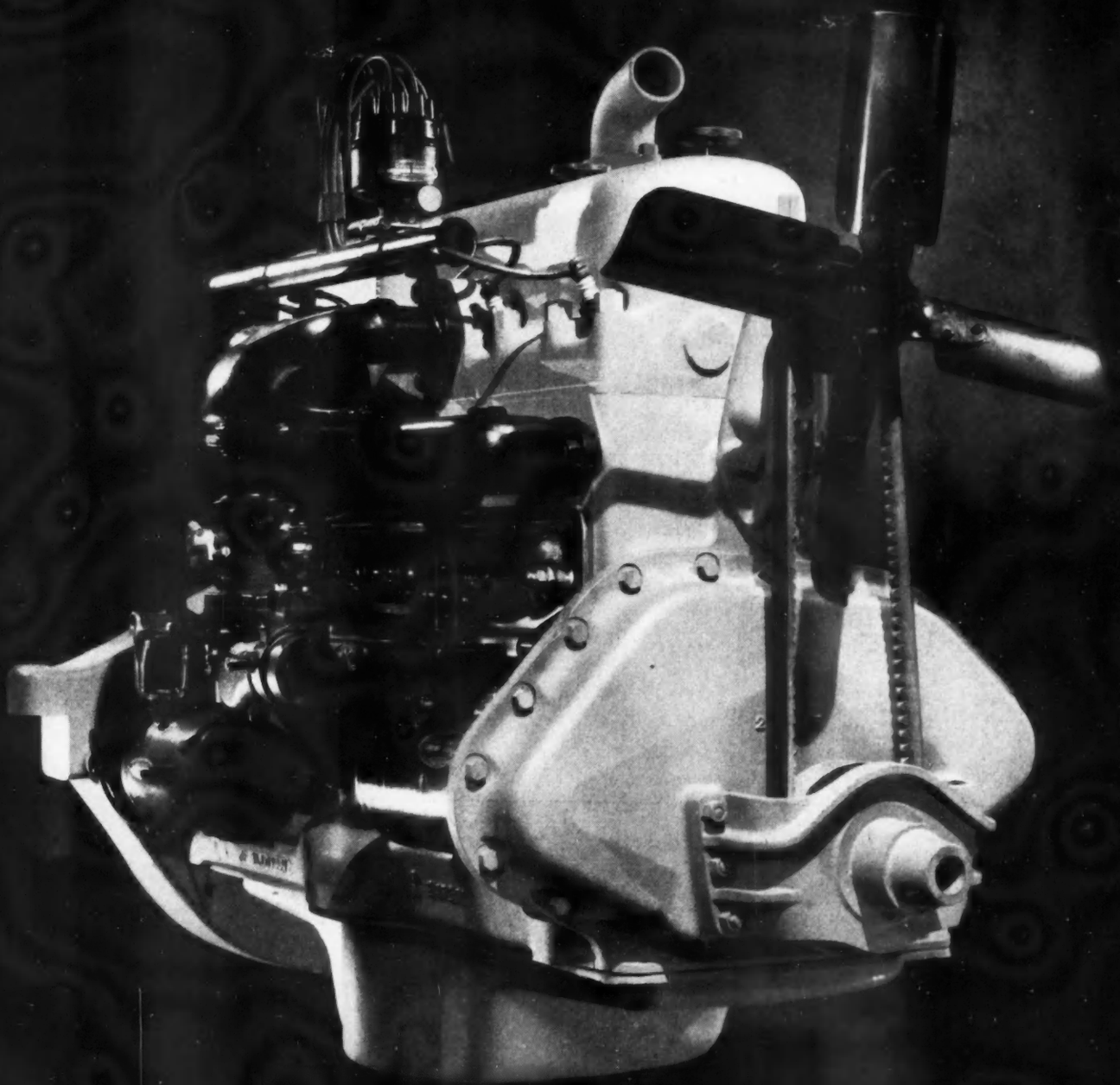

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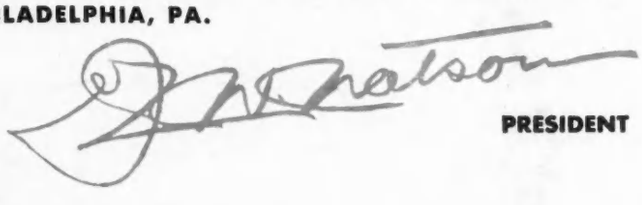

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